

PC MAGAZINE

PENTIUM REPORT: WHAT'S UP INSIDE?

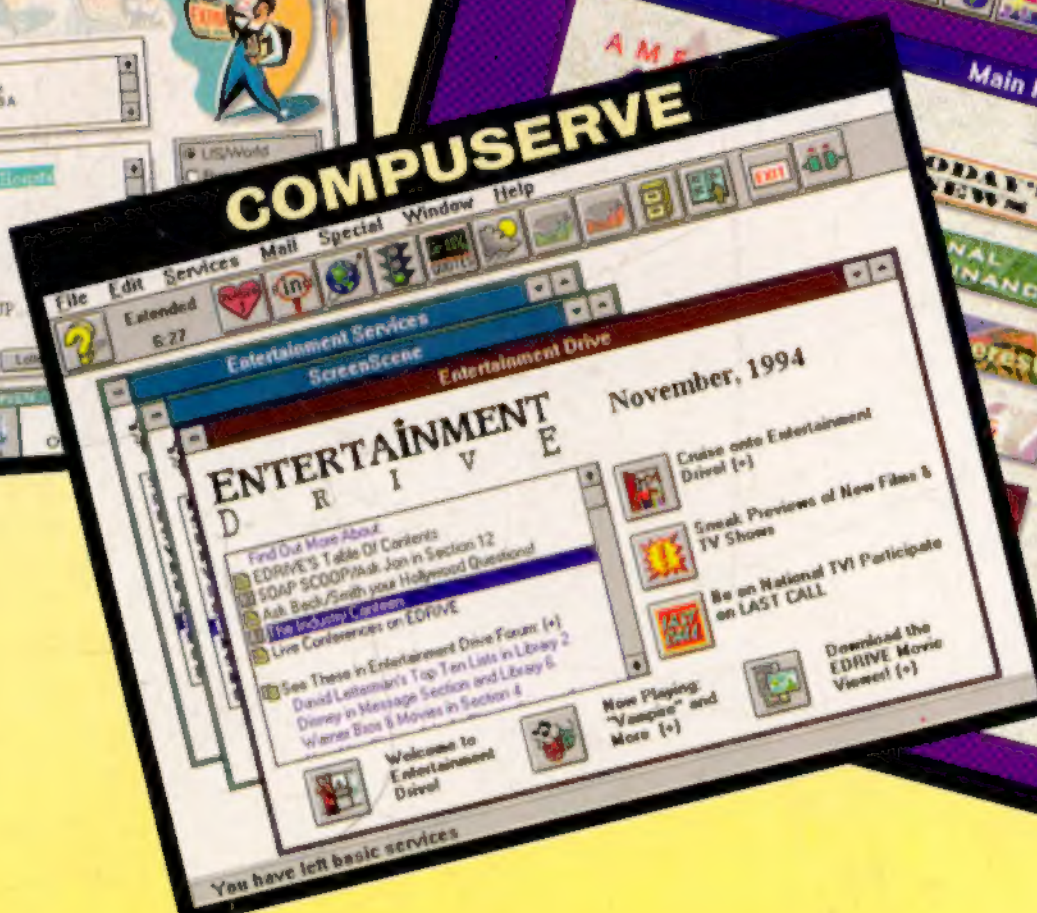
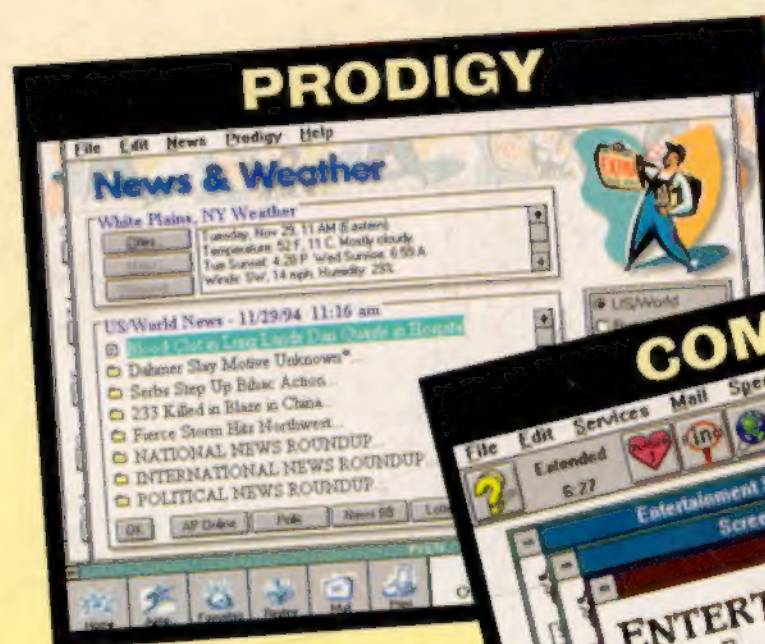
- ▶ John Dvorak and Michael Miller
On the Pentium Bug Aftermath
- ▶ First Looks at the New 100-MHz
Pentium Desktop PCs
- ▶ Competition in the Wings: AMD,
Cyrix, and NexGen Take On Intel's Pentium



Many Happy Returns: 14 Tax Preparation Packages to Guide You Through Taxing Times

The Changing Face of

ON-LINE



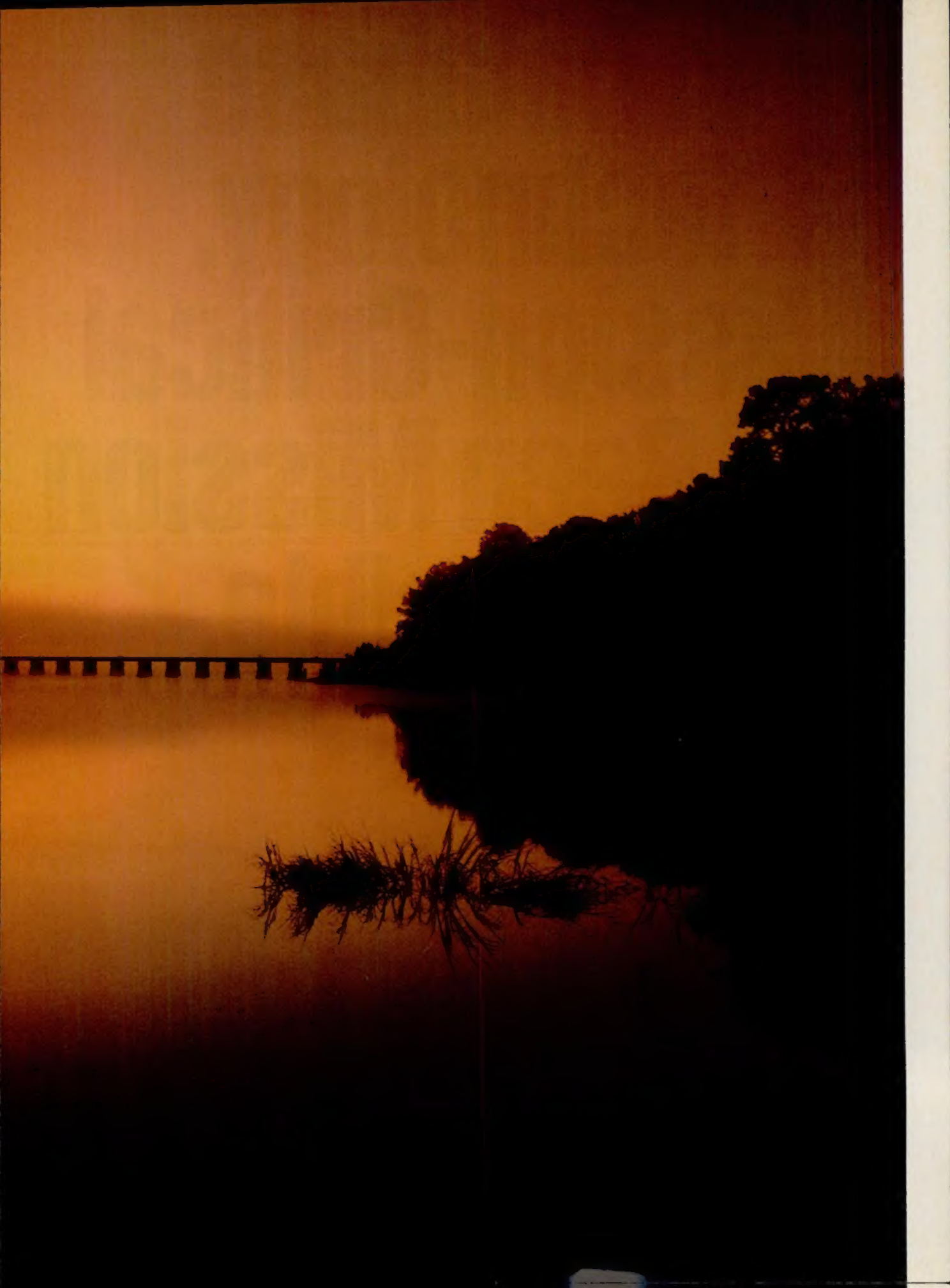
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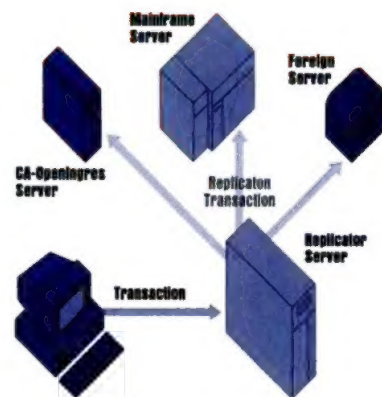
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Inside

There's no doubt about it: The on-line world is changing faster than ever. New services are on the horizon, and the existing services have grown by leaps and bounds.

When you log on, you're likely to find

more information, more people, more links to the Internet and other services, and a friendlier user interface than ever before. In our cover story, "The Changing Face of On-Line," our networking team—headed by associate editor Gail Shaffer and project leader Rob Lipschutz—takes a close look at the major on-line services and

Being on-line, of course, is nothing new for *PC Magazine*. We've been a part of the on-line community for more than ten years, beginning with our Interactive Reader Service bulletin board, which evolved into PC MagNet and then into the larger ZiffNet, where all the Ziff publications maintain forums on CompuServe.

More than 250,000 readers join us there, and the number of files, utilities, and discussions is always growing. (GO:ZNT:Editorial.)

Our on-line presence has extended onto other services. Many of our utilities and files are also available on ZiffNet on Prodigy (Jump Ziff), and we've seen phenomenal growth in



PC Magazine: Ten years on-line and going strong.

the kinds of information they offer, and determines which are best for different kinds of users.

Recently, on-line services have received a great deal of media attention. For instance, the flurry of interest in the Pentium bug was fueled by comments and analysis on the Internet, CompuServe, and other services. On-line lent an immediacy to the issue.

Nearly every major magazine and newspaper has a presence on one on-line service or another.

the number of people reading our pages on the World-Wide Web as well (<http://www.ziff.com/pcmag>). Also, executive editor Rick Ayre is leading our on-line efforts into other new services.

On-line enables us to get important files and information to you—faster and in more depth than any other medium allows. It also serves as a way to conduct a personal dialogue with you. So join us on-line and let us know how we're doing.—Michael J. Miller

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1. Because it runs at 100MHz. Period.
2. It's the best value in Windows-compatible CPUs.
3. There is no such thing as a faster 486.
4. It's 100% Microsoft Windows-compatible.
5. It runs all your favorite Windows programs — really fast.
6. It's an incredible value.
7. Your applications don't run in clunky emulation mode.
8. Every bit as good as a 60MHz Pentium. And a far better value.
9. It's the Ferrari of 486s.
10. 100MHz speeds. Wow!
11. Two words: price/performance.
12. Three words: Value! Value! Value!
13. It comes from AMD — the leading alternate source for 486 devices.
14. It puts 60MHz CPUs to shame.
15. Good luck finding a better value.
16. "The robust 486 is alive and well." — Michael Slater, Microprocessor Report.
17. Slater continues, "Enhanced 486 chips will play a major role in 1995."
18. Slater concludes "...an aggressively priced DX4 chip would be a great product."
19. 100MHz...cool!
20. Unlike some CPUs, it's good with figures.

21. Killer part. Killer speed. Killer value. Killer!
22. Certified 100% Windows-compatible by XXCAL. And they're really picky.
23. You don't have to upgrade all your existing software.
24. For all you chip-heads, we use 0.5 micron process technology for our 486 devices.
25. It's tried and true technology at a great price.
26. We were tempted to paint racing stripes on the side.

44. And Prodigy, too.
45. It runs everything you need it to, much faster.
46. My 486 is faster than yours! Neener neener neener!
47. It runs Lotus 1-2-3.
48. Lotus Notes.
49. Lotus SmartSuite.
50. And every other Lotus program you can think of.
51. 100MHz. Case closed.
52. Grease + lightning = 100MHz Am486.
53. Your 386 users will kiss you.

67. It runs Harvard Graphics.
68. Corel DRAW!
69. Aldus PageMaker.
70. Adobe Illustrator.
71. Adobe Photoshop.
72. Even AutoCAD.
73. You're incredibly smart when it comes to these kinds of decisions.
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75. You sure know a great value when you see one.

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89. Certified 100% Microsoft Windows-compatible. As if you didn't know.
90. It's like driving in the commuter lane, all the time.
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92. Even the folks with big budgets will admire your business sense.
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94. You don't have to double check your math.
95. Compaq says, "100MHz 486 systems represent a significant market opportunity and we are delighted there will be an additional source of supply." — Jim Paschal, Vice President of Desktop and Corporate Engineering.
96. The mere thought of an AMD CPU somehow appeals to your rebellious side.
97. Can actually handle the rigors of complex calculations like *division*.
98. We've got ISO 9000 certification — in plain English, that means world class manufacturing facilities.
99. Look up "tight-wad" in the dictionary and there's a picture of your boss.
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32. Runs Microsoft Word, without a hitch.
33. We'll say it again, it's 100% Microsoft Windows-compatible.
34. It's Windows NT-compatible, too.
35. And Microsoft Excel.
36. Microsoft Office.
37. Microsoft PowerPoint.
38. Pretty much everything Bill Gates has to offer, it handles flawlessly.
39. Don't forget Quicken.
40. You only live once.
41. Surf the internet @ 100MHz.
42. Runs CompuServe.
43. Runs America Online.

54. It's a smart move.
55. Runs WordPerfect.
56. Also WordPerfect Office.
57. And ClarisWorks, for that matter.
58. If you don't upgrade soon, your users will have you drawn and quartered.
59. Megahertz. 100 of them, to be exact.
60. We've invested over a billion dollars so we can keep cranking out tons of them.
61. Think you can pass up a deal this great?
62. You must be interested in high performance — you're still reading.
63. It's the greatest 486 ever made.
64. You're too smart to pass this offer up.
65. Why not?
66. It's tough to argue with 100MHz performance.

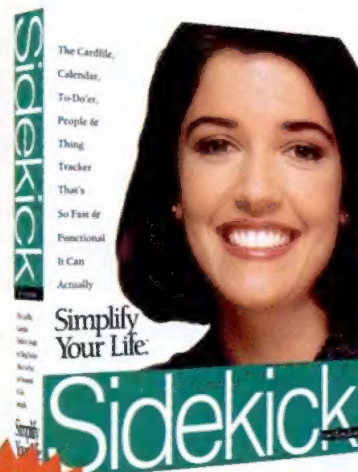
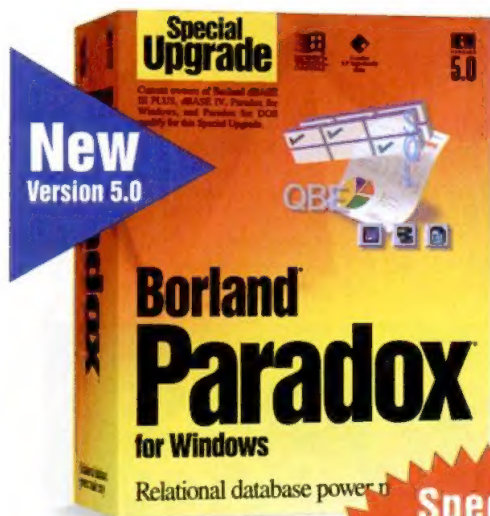
76. Damn, it's fast!
77. Did we mention that it's the best value available in 486 CPUs?
78. Now you can afford that cellular phone.
79. Without a doubt, the best value in 486 CPUs.
80. Everyone in your office will be jealous.
81. 100MHz. Golly, that's fast.
82. It's at least worth a test drive, isn't it?
83. Turtles run faster than your current systems.
84. Performance equal to a 60MHz Pentium.
85. Runs PC Tools.
86. And Norton Utilities.
87. Also Norton Desktop.



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UP FRONT

COVER STORY

Inside

The golden age of on-line.4

Letters

The impending doom of
DOOM19

Trends

- What's behind the Windows 95 delay?
- The Pentium epilogue
- IBM ThinkPad's folding keyboard
- Digital cash on the Internet29

First Looks

- Panasonic CPA
- PerfectOffice 3.0
- AutoCAD 13
- Polaroid SprintScan 3537

New & Improved

BY ASA SOMERS61

Read Only

EDITED BY TIN ALBANO73

COLUMNISTS



Michael J. Miller

Once Lost, Can Trust
Be Regained?79

Bill Machrone

Compulsive
Communicators87

John C. Dvorak

A Modest Pentium
Proposal93
Inside Track95

Jim Seymour

Record Your Own
CD-ROM99

Bill Howard

1,200 Ways to Worry HP...103

On-Line Services



The Changing Face of On-Line

BY RICK AYRE AND ROBIN RASKIN Here's a face that really does improve with time: the face of on-line. If you haven't been on-line yet, maybe this is an area of our industry that has finally caught up with you!

In our annual roundup of commercial on-line services, we see bold new graphical interfaces (making for easier installations), better content, and more attractive pricing—and good combinations of the three. Finding the right balance may seem tricky, but we sort out a lot for you. We focus more on content this year—databases, discussion forums, timeliness of updates—because content is what draws most people on-line in the first place. We also sketch out the rest of the on-line landscape for you and point out some alternatives108

America Online.....127	Highlights.....110	Coming Attractions.....132
CompuServe Information Service.....128	Editors' Choice.....111	The Scavenger Hunt.....136
Delphi Internet.....138	Seven Ways to Save Time and Money On-Line.....114	Information to Go, Please.....141
Dow Jones News/Retrieval with MCI Mail.....145	Quick Take on Content.....116	A Change of Face.....142
GEnie.....150	Internet Trail Guide.....118	The Line on New Services.....150
Prodigy.....152	Suitability to Task.....120	Information Providers at a Glance.....159
	Cost Comparison.....128	Routes to the Net.....166



CPUs

What's Next Inside?

BY JOHN CLYMAN Intel's Pentium no longer holds an unassailable performance lead among desktop CPUs. NexGen's Nx586 already offers comparable speed, and the forthcoming AMD K5 and Cyrix M1 should further up the ante. We look at the strengths and weaknesses of the various 586-class alternatives and at how they will affect your next PC buying decision....177

*The Pentium and Its Competition
at a Glance178*
Winstone 95182

Inside the Chips

BY NICK STAM We take an inside look at how the Pentium and its competitors achieve impressive performance

Pipeline Operation: Key to Pipeline-Operation Diagrams	190
Pipeline Operation: Classic Five-Stage Pipeline	191
Classic Superscalar Processor Organization	193
Superscalar Architecture: Decoupled Pipeline	193
Pipeline Operation: Dual-Issue Superscalar Design	195
Pipeline Operation: Impact of Issue Restrictions	196
Pipeline Operation: Impact of Pipeline Stalls	199

levels. We explain the principles underlying high-performance processor design and explore the different trade-offs AMD, Cyrix, and NexGen make in their products190

Software

Happy Returns After a Taxing Year

BY KATHY YAKAL Every year, *PC Magazine's* fourth issue heralds the arrival of tax time. Once again, we examine the latest and greatest tax-preparation

software—packages that help you organize all your receipts, find all your deductions, plug in all your numbers, and file an accurate, timely return. We review 11 DOS and Windows products, highlight an OS/2 newcomer, and deliver pointers on the pros and cons and tips and tricks of filing your IRS return electronically.....201

AM-Tax Personal 1040.....	204
Kiplinger's TaxCut.....	208
TaxCut	208
Simply Tax for Windows.....	210
Personal Tax Edge.....	218
TaxSaver	218

TaxPerfect Personal 1040.....	222
TurboTax	224
Editors' Choice.....	203
Ten Things You Should Know About Electronic Filing.....	215
Summary of Features.....	219

PC TECH

User-to-User

PC MAGNET BY NEIL J. RUBENKING Even faster access to Control Panel applets; rebooting from the command line; persistent environment-variable glitch.....227

Tutor

PC MAGNET BY JEFF PROSISE 3-D Graphics in Windows NT 3.5.....229

Corporate Developer

BY BARRY SIMON Taking Windows Help to the Limit.....233

Toolkits

BY NEIL J. RUBENKING Essential Tools for Visual Basic.....238

Environments

BY CHARLES PETZOLD Windows 95 and the Evolving User Interface.....243

Power Programming

PC MAGNET BY JEFF PROSISE Owner-Drawn Push Buttons: As Simple as M-F-C.....247

Utilities

PC MAGNET BY DOUGLAS BOLING Kick-Start Programs with DropKick.....254

PC SOLUTIONS

Hardware

Assigning two printers to the same IRQ line; math coprocessors and laptops; adding memory to an aging PC; extending your monitor cable.....259

Operating Environments

PC MAGNET Comparing two PATHs in a batch file.....269

Word Processing

Building a function library in Microsoft Word for Windows.....274

Spreadsheets

Ignoring blank cells in Lotus 1-2-3 worksheets—without using database statistical functions.....274

Graphics

Getting the wrong colors when you translate image files from one format to another.....278

AFTER WORDS

After Hours

- **Fun-filled facts:** Learning games for kids
- **CD-ROM Pick Hit:** Microsoft Complete NBA Basketball
- **Spotlight on Adventure:** The Journeyman Project Turbo
- **Kids:** The Rabbits at Home
- **Sports:** NHL Hockey 95
- **Quick Clips**.....365



Kids, even preschoolers, can learn life skills with *The Rabbits at Home* (page 365).

Abort, Retry, Fail?

BY DON WILLMOTT.....376

ALSO IN THIS ISSUE

Direct Marketing Connection.....	270
Marketplace.....	331
Premier.....	331
Classified.....	340
Business Cards.....	355
Reader Service Card.....	353
Index to Advertisers.....	359
Advertisers' Product Index.....	360
Coming Up.....	362
Editorial Product Index.....	363



Find an answer to even the most obscure hoops trivia question (page 365).



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Except where noted: All *PC Magazine* reviews are of currently available products. Benchmark and performance tests are run on Compaq Deskpro 486/33M's.

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In the



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Technology, applications share more common com-

The perfect office would have no politics.

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Imagine software that works for you, not vice versa.

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5 In the perfect office, everyone would share ideas.

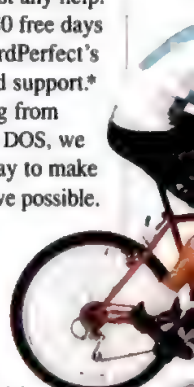
It's called collaboration. And only PerfectOffice offers Envoy™, a workgroup publishing tool that lets users electronically view, annotate and distribute your documents—complete with graphics and typefaces. They don't even have to have Envoy or the software they were created in.

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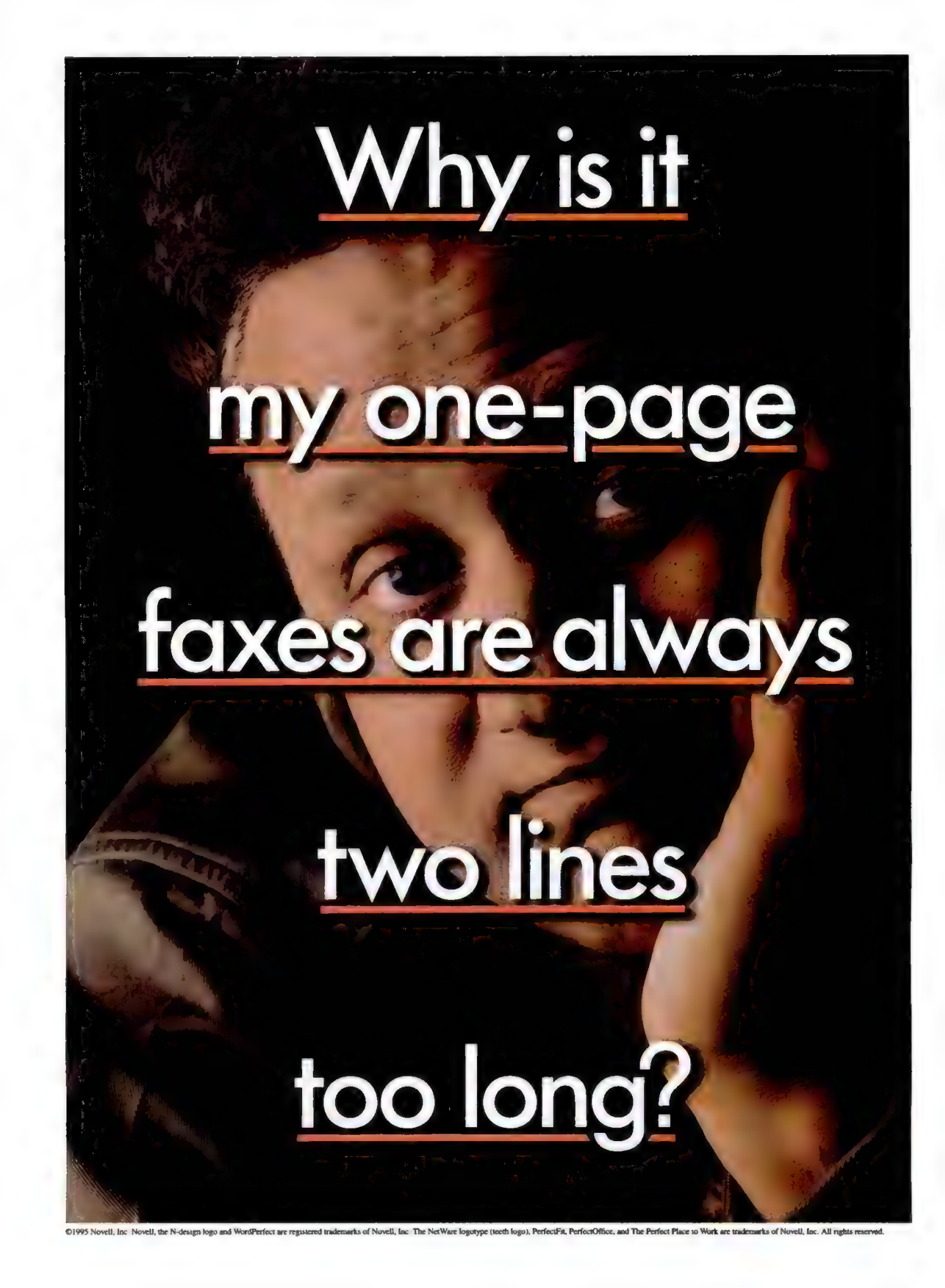
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A close-up, high-contrast photograph of a woman's face, looking directly at the camera. Her hand is visible near her chin. The image is dark and grainy, serving as a background for the text.

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slapping them on your room tab.

And if you're wondering why we're talking about file transfer in a remote control ad, you should know that, according to IDG Research, it's the second most frequent thing remote control software gets used for.

And what, you ask, is the first most frequent thing?

E-mail, of course. Which is another reason to specify LapLink for Windows.

Because only LapLink for Windows lets you use remote control to read your e-mail in one window while you transfer files in another. Simultaneously.

If you like that, you'll just love running multiple services in multiple windows to multiple PCs, all at the same time.

All together now.

What's that? Did we say "multiple PCs, all at the same time?"

You bet your support costs we did. In fact, you can connect—via modem, cable or network—to as many as 15 PCs at once.

Which makes LapLink for Windows the most cost-effective way to set up multiple PCs, monitor remote systems, diagnose and resolve problems, distribute new software and teach everybody how to use the stuff.

By now, your overburdened support technicians may be



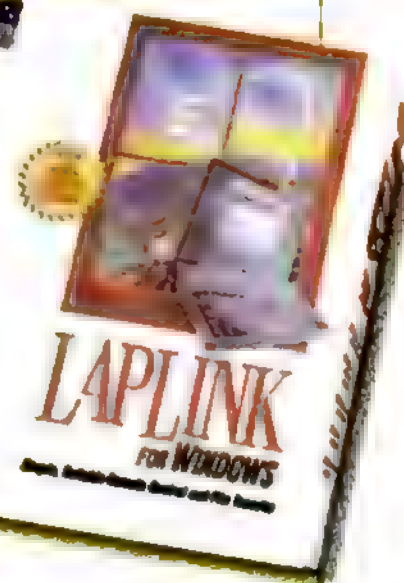
Only LapLink for Windows lets you connect multiple PCs (up to 15!) and perform multiple tasks simultaneously.

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We'll answer questions, tell you about our ridiculously inexpensive competitive upgrade, and send you a free copy of *The Practical Guide To Remote Control*.

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We couldn't have said it better ourselves.

"LapLink for Windows fulfills the promises that remote control has been making for the past seven years."
PC Magazine, U.K. Oct. '94

"LapLink for Windows 6.0 is seriously good stuff. Recommended."
BYTE Magazine, Jan. '95

"If you use more than one computer, you need LapLink for Windows."
PC Computing, Nov. '94

"Installation is simple and the connections are easy to set up."
Windows Magazine, Dec. '94

Letters

DOOM: HERALD OF SOCIETY'S DOOM?

John C. Dvorak's column "Blow Their Heads Off!" (November 8, 1994) typifies the sentiment of many Americans. Contrary to Dvorak's assertions, the violence in computer games such as DOOM and Mortal Kombat is even more harmful than that of cartoons. These games allow individuals to become active participants in the fake violence. From there, it's a very short transition to carrying these tendencies into other aspects of our lives; we lose sight of the value of human life. We should be putting this programming ability and technology into advancing our society, not into promoting destruction.

*Larry Baumgart
via the Internet*

There's nothing I like more than a good shoot-out against Baron von Richthofen or a fight to the death against Bruce Lee, but the question remains as to the violent nature of these games. Though there isn't much credibility in saying a game like DOOM might give a kid the urge to go out and shoot someone, there is credibility in the fact that these games desensitize us to violence. There's so much violence around us that we're no longer shocked. These games are even legitimizing something we once held as taboo: violence as a means to an end.

*Mark Osterweil
via the Internet*

Personally, I continue to be appalled and amazed by the level of violence in movies and computer games. But Dvorak doesn't take his argument far enough and falls victim to the "it's somebody else's fault" syndrome. Blaming Hollywood for violent movies is not the answer. Regardless of whether violence in movies is a reflection of society, the public supports it with its patronage. Such support only ensures that more violence will be forthcoming from Hollywood.

*Geoff Clevenger
via PC MagNet*

As machines get faster and the graphics capabilities improve, more drastic and realis-



*This technology should go
toward advancing society,
not promoting destruction.*

tic scenes will appear. "Computer-based killing" is no less of a simulation than taking off with Microsoft Flight Simulator.

*Christoph Schalcher
via the Internet*

It may not be politically correct to say, but DOOM is a violent game. It's no less violent than Dvorak's example of a game that is unquestionably sick, Sega's Night Trap.

*John A. Jackson
via PC MagNet*

The last things to cause violence on our streets are films, television, or computer games. The "experts" have been trying to prove it for years to no avail.

*Cory Thompson
via PC MagNet*

Soon, we can expect our youngsters to be transforming themselves into living-room commandos blasting the heck out of digital villains. As adults, we look at these games with the same amusement we have when seeing Clint Eastwood blow away five bad guys at close range. But kids sometimes fail to differentiate fantasy from reality. The computer gaming industry should not be separated from Holly-

wood. They are both a source of audio-visual entertainment.

*Scott Greer
Portland, Oregon*

SHAREWARE BEYOND DOOM

Your article "The DOOM Phenomenon" (November 8, 1994) is generally complete and well-done. But I am both dumbfounded and surprised by the popularity of DOOM, given its poor graphics (which make me dizzy) and linear storyline. Instead of your four pages of coverage, I would have preferred to see more in-depth analyses of the other shareware products you recommended (including DOOM add-ons) and where you can get them on the Internet.

*Jason C. Huang
Los Angeles, California*

• For all the DOOM editors and related tools you could possibly want, check out the GAMERS and MODEMGAMES forums on CompuServe or GAMEWORLD and PBSARCADE on ZiffNet. Internet surfers have a choice of several different sites, including [ocf.unt.edu](http://ocf.unt.edu/pub/doom/text) (in directory [/pub/doom/text](http://pub/doom/text)), [ftp.uwp.edu](http://ftp.uwp.edu/pub/incoming/id) (in directory [/pub/incoming/id](http://pub/incoming/id)), and [wustl.edu](http://wustl.edu/pub/msdos_uploads/games/doomstuff) (in directory [/pub/msdos_uploads/games/doomstuff](http://pub/msdos_uploads/games/doomstuff)).—Ed.

THE THRILL FIZZLES

What does Robin Raskin mean, she believes her daughter "has a point" about the computer taking longer than manual cut-and-paste? (Pipeline, "After the Thrill Is Gone," November 8, 1994.) At the age of 12, Raskin's daughter has hit on a basic principle of productivity that eludes many MBAs and IS executives. Computers are just a tool to get us from point A to point B; they are not necessarily the best tools for all purposes. The science and art of measuring productivity is extremely complicated. Children are often the best trained to use computers as they are meant to be used; perhaps we, as adults, should take note of their lead.

*S. Raja Gopalan
via PC MagNet*

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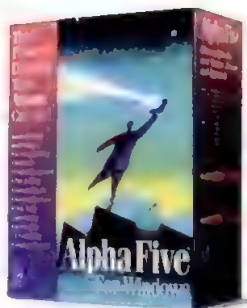
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LETTERS

Artistically speaking, I hope that crayons, pencils, markers, and paper will be around a long time. I don't mind a paperless office, but I'd hate to see a paperless child.

*Steve Holzinger
via the Internet*

Raskin would have had much better results had her child been working on a Macintosh. It really makes me laugh to hear the complaints PC users have. If only they could see how all of their suffering could have been eliminated had they chosen a productivity enhancer rather than a ball and chain.

*Robert Barcos
via PC MagNet*

SETTING THE RECORD STRAIGHT

Autodesk submitted both AutoCAD Release 12 for Windows and AutoCAD LT to be critiqued in your story on 2-D CAD software ("CAD's New Face," October 25, 1994). AutoCAD 12 was selected as the Editors' Choice among extensible applications, but AutoCAD LT was not included in the roundup. *PC Magazine* did not believe that AutoCAD LT had a macro language; you did, however, review TurboCAD—an AutoCAD LT competitor that has the same macro language capabilities as AutoCAD LT. The command scripting language in AutoCAD LT provides an easy way to automate any series of commands.

*Cary Fulbright
Director of CAD Marketing
Autodesk Inc.
Sausalito, California*

MULTIMEDIA MANIA

After reading your roundup of multimedia kits ("Moving Up to Multimedia," October 25, 1994)—in which, among other things, you discussed the potential hazards of installing the kits—I was prepared for the worst. But when the time came to install my new multimedia kit, it all went very smoothly. Maybe I was lucky. Still, you may be scaring people away from doing something that is well within the capabilities of the average

computer user. Now if only I could figure out that encyclopedia. . . .

*Lewis Amundson
via the Internet*

We here at Peavey were greatly disturbed by a sidebar to your review of multimedia upgrade kits ("Do MPC Systems Measure Up?"). It noted that the Dell Dimension XPS466V is bundled with Peavey speakers, "which, despite the well-known name, yielded poor sound." We feel the comment is inappropriate considering that the Peavey model 200 speakers that come with the Dell retail for \$79 individually, while the other speakers described in the article have a street price of well over twice that amount. At these higher price levels, substantially more performance can be engineered into the product.

*Jon M. Risch
Senior Project Engineer
Peavey Electronics Corp
Meridian, Missouri*

FINDING HOME PCS

Bill Machrone's column "A PC for the Home" (November 8, 1994) identifies some key points about the home PC market. From the manufacturer's perspective, one barrier to producing Machrone's ideal home PC is the complexity of software. With the myriad of installation conflicts and the nonstandardization of resource use, it seems almost impossible for the average home user to install and use any application. Until these complications change, PCs for the home still won't be for the average home.

*Kan Chun
via the Internet*

THE INHERENT BEAUTY OF FRACTALS

I thoroughly enjoyed the artistic creation of your fractal program in "Fractals and Data Compression" (November 8, 1994). It makes you wonder if nature uses a kind of chemical equivalent to some of those formulas to create anything from leaves to maybe even humans! I never knew a simple math formula could create such beauty and elegance from a stream of randomly generated numbers.

*Larry N. Barnes
via the Internet*

ORIGIN OF PC SPECIES

Michael J. Miller rightly decries the lack of innovation in PCs ("Origins of PC Species," November 8, 1994). But innovation is lacking primarily because the operating system doesn't encourage it. As long as one company controls the operating system and many companies manufacture the hardware, change will be incremental.

*Dana Bourgeois
via the Internet*

It's always annoyed me that the PC has progressed very little from the clunky box IBM introduced over a decade ago. You'd think intense competition and improving technology would foster innovation and improvement. Sadly, today's typical PC is still a complex, colorless square thing with lots of stuff dangling from it.

*Eric Jorgensen
via the Internet*

RADICAL RAD

Your article on Rapid Application Development ("RADical Development," November 8, 1994) was highly enjoyable. I'm always looking for new ways to develop applications faster. The RAD route sounds good, but I'm not yet willing to dish out the necessary \$1,000 or more.

*John Councill
via the Internet*

Your wonderful article on RAD tools provided highly informative data comparing various tools' functionality and ease of use.

*Bert Scalzo
via the Internet*

HOW TO WRITE TO PC MAGAZINE

We welcome your comments and suggestions. Please send correspondence to Letters, *PC Magazine*, One Park Ave., New York, NY 10016-5802. You can send electronic mail via the Internet at 157.9301@mci-mail.com, or you can upload it to PC MagNet (see page 12 for access information). You can also send e-mail to individual editors. Type GO PCMSTAFF on ZiffNet for a list of addresses. All letters become the property of *PC Magazine* and are subject to editing.



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Nokia Multigraph 449E



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Nokia Multigraph 447X



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Nokia Multigraph 447X



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To meet your needs exactly, we offer you power, speed and memory choices—a genuine Intel 486DX2-50 or DX4-100 microprocessor; 4 or 8MB RAM user upgradable to 20MB; and IDE hard drives from 175 to 350MB.

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Meridian 400 with unretouched photo of active matrix display.

palm rest; and an 84-key keyboard with inverted “T” arrow keys and an integrated TruePoint™ pointing device.

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At just under four pounds, the ZEOS Meridian 400 subnotebook is molded from a special carbon-fiber material that cuts weight and improves durability. It offers you the perfect approach to traveling, working abroad, and second system computing. As *PC Magazine* said: “The ZEOS Meridian...pushes a subnotebook’s abilities to new heights.”

The 400 features three screen options: 7.9" diagonal active matrix, 7.9" diagonal passive matrix, or 8.2" monochrome. You also get two Type II PCMCIA slots and an external ultra-light 3.5" 1.44MB floppy drive (standard on Packages 2 and 3).

Meridian 800 Notebook

Desktop power to go! At six pounds and change, the ZEOS Meridian 800 is light enough to travel anywhere yet



Meridian 800 with unretouched photo of active matrix display.

it's large enough to use for presentations and regular desktop computing. You get the best of both worlds!

For your viewing pleasure, the 800 is available with your choice of color displays: a whopping 10.3" diagonal dual scan or 9.5" diagonal active matrix. The Meridian 800 also includes two Type II or one Type III PCMCIA slots; a removable hard drive; and an internal 3.5" 1.44MB floppy drive.

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Active Color	400A	800A	Active Color	400A	800A	Active Color	400A	800A
486DX2-50	\$2695	\$3095	486DX2-50	\$2995	\$3295	486DX2-50	\$3295	\$3595
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- Supports an external SVGA color monitor at resolutions up to 1024 x 768.
- PCMCIA slots. 400: 2 Type II, 800: 2 Type II or 1 Type III.
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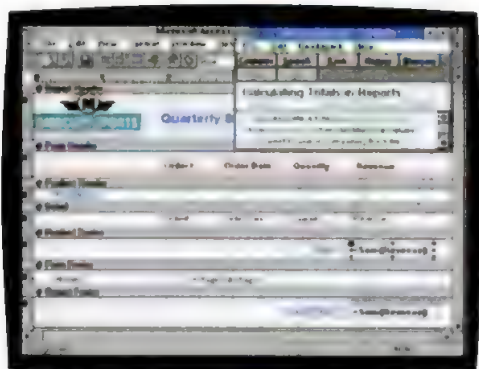
Until now, a lot of people who would really benefit from a desktop database really couldn't. The rule of thumb being, the more powerful the database the more ornery it is.

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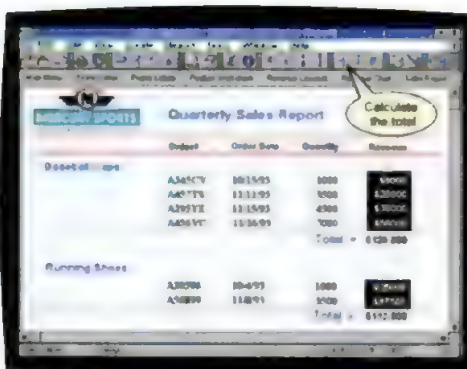
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PC/Computing 7/94

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Windows Magazine 8/94

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Learn to program

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APPROACH

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Just do it

No programming

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Work with familiar concepts like 'Reports' and 'Forms'

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Trends

TRENDS & TECHNOLOGY SHAPING THE PERSONAL COMPUTER MARKET

Windows 95... or 96?

Microsoft's delay has widespread ramifications.

During Intel's Pentium debacle of mid-December, Microsoft suffered through its own public relations crisis when it announced that it was delaying Windows 95 in order to "deliver a vigorously tested product." This second delay since September now pushes the

launch date to August 1995 and leaves Windows users waiting, software developers squirming, and IBM looking for opportunities.

In the wake of the Pentium scandal, it seems that Microsoft felt it could afford delays far more than it could afford compatibility and installation glitches. "Probably our hardest job will be to install smoothly over the tens of millions of machines and also to be compatible with the incredible breadth of hardware and software that people are running today," says Rogers Weed, group manager of the Personal Operating Systems Division at Microsoft. He says Microsoft made the decision to delay after getting feedback on installation and compatibility from users of the second beta release.

More steps during installation and more complex compatibility issues aren't the only changes since Microsoft's last major OS roll-outs. The operating system landscape is vastly different from a few years ago, when Windows 3.0 had to prove itself as a viable GUI in an ultra-competitive landscape. Microsoft even competed with itself—it had to win the hearts of DOS users. And while Windows 3.1 launched into an installed base of around 10 million Windows 3.0 users, Windows 95 will launch into an installed base of around 60 to 70 million Windows PCs.

All those potential upgraders lose in the face of the delay, but software developers lose, too. More than ever, developers are dependent on Microsoft's schedule. The delay will have minimal impact on

then that's potentially negative." Corel's stock dropped more than 10 percent the day Microsoft announced the delay, as the company postponed CorelDRAW Version 6's May ship date.

Lotus is expecting a very healthy market for Windows 3.1 applications in 1995. "It's a good thing we were prepared for the delay," says Peter Cohen of Lotus. "We had decided a while ago to do parallel development of new 3.1 apps along with new Windows 95 apps. That puts us in a pretty good position to have new 3.1 apps for the desktop and not have to sit on our hands until Windows 95 comes out."

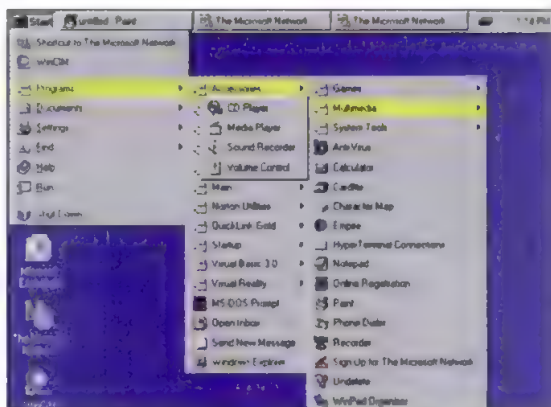
But most developers can't make that kind of investment. "I can imagine that this could really hurt some other companies," says Cohen. "For those folks who can't do

parallel development or who can't stay as close to Microsoft as we do, boy, this is really very tough for them. It makes them even more dependent."

Perhaps only IBM sees the delay as good news. "Software developers now have to face the possibility of no upgrade revenue, and no new product revenue, for almost a year, unless they rev their 16-bit apps before they launch their Win 95 apps," says Jo Ann Sager of IBM. IBM is working with software developers to write applications for OS/2 Warp—and then make the "easy" transition to the PowerPC when it ships in 1995.

In early March, Microsoft expects to make software history with an unprecedented *prelaunch*. Neither a formal beta program nor a retail product, the Windows 95 Preview Program will be a third version of the beta software that anyone can buy from Microsoft for \$30. Microsoft expects several hundred thousand people to buy the Preview Program. Details will be published in Microsoft's on-line

newsletter, WinNews. To subscribe, send e-mail to enews@microsoft.nwnet.com and ask to subscribe to WinNews.—Carol Levin and Sebastian Rupley



Microsoft is postponing the release of Windows 95 so it can work on two problem areas: installation and compatibility.

Micrografx, says CEO Paul Grayson. But, he says, the delay leaves developers on the fence. "If you're delaying a release already and this causes you to stretch it out longer,

Pipeline *By Robin Raskin*

Is There a SQL Server in Camelot?

How do you get to be top dog in the SQL arena? Ask the three SQL vendors with the biggest dukes, and you'll get three different answers. The one who gets it right will win big time. Here's how the battle is shaping up:

The Sybase "Power(Soft) in Numbers" Tactic. Last November, Sybase and PowerSoft jointly announced their agreement to merge and create a unified leader in the field. The marriage of the world's best-selling front-end client tool and the world's second best-selling relational database management system



is nothing to sneeze at, but these guys have let a few months go by without articulating their strategy. Both parties have promised to remain committed to an open architecture and to supporting multiple tools. And both have promised killer product solutions that make use of their shared technologies. All possible—but not easy.

Sybase was losing business to Oracle because Sybase lacked an integrated toolset. Sybase's own Momentum family of tools were terrifically ambitious and very late to market. Now, overnight, Sybase is the parent of the best-loved front-end tool. Together, they've got to establish a Sybase-Powersoft synergy quickly or, except for a better distribution channel, the clout of the merger will be lost upon mere mortals.

The Oracle "We're Number 1" Tactic. Hey, no one said being top dog was easy. Oracle is clearly an aggressive leader

with its finely tuned SQL back ends, and it's making killer debuts of its front-end tools. Oracle recently introduced a group of Visual Basic controls and C++ libraries for quick and easy development. It also has Project X (a Visual Basic clone with object-oriented extensions that will partner nicely with its workgroup solution, Oracle NT) and Oracle CDE, a powerful set of integrated forms-based tools. It has scalable cross-platform solutions that range from notebook to workgroup to enterprise, and a sales force that would do the Brooklyn Bridge wonders. And while Oracle has the most expensive solution per client of the three, the cost per transaction is low enough to defray the hit. What these guys are missing is a sense of the PC market, but they're learning.

The Microsoft "Office of the Future" Tactic. Just who do these guys think they are, anyway? They launch the NT operating system, and then walk off with Sybase's SQL server and rewrite it as their killer app. Microsoft SQL is so well integrated with NT that you'll be hard-pressed to figure out where one starts and the other stops. They've got great GUI administration tools, and SQL Server is no toy when it comes to performance, either. But Microsoft is betting on the future, and its future is Windows.

Microsoft isn't wasting any breath promising cross-platform solutions here; there are no links to mainframe databases. Microsoft is fond of proclaiming that it doesn't speak DB2 or VMS. Its idea of a powerful machine is tossing a couple of extra processors at a PC. But the real Achilles' heel is Microsoft's client-side tools. Right now the company's got Visual BASIC and Access—neither one a terrific development tool for distributed SQL apps.

Imagine a SQL Camelot: Oracle's cross-platform strength, the Sybase/Powerbuilder client/server synergy, and Microsoft's pricing and GUI smarts. Will I see you in Camelot?

Robin Raskin is the editor of PC Magazine.

The Pentium Epilogue

IN DECEMBER, WHEN IBM announced that it was halting shipments of systems based on Intel's Pentium chip due to a flaw in the chip's floating-point unit, system vendors at large were expected to echo Big Blue's vote of no confidence. Did they?

The answer is a resounding no. Of 11 leading system vendors—Acer, AST, AT&T, Compaq, DEC, Dell, Gateway, Hewlett-Packard, Packard Bell, and Toshiba—not a single one reports any interruption in Pentium system shipments. Nor are buyers flustered. On the contrary, the scandal surrounding the Pentium chip coincided with a mini-renaissance in sales of Pentium systems. Packard Bell, for one, reported that fourth-quarter sales of Pentium-based systems were more than double its sales for the first three quarters of 1994 combined. Initial reports on overall holiday retail sales of PCs were equally glowing.

Although Intel has done a complete about-face from its original policy of replacing only some chips, the replacement policy is not to be confused with a recall (which would have been much more costly to Intel). Because the sales channel was flooded with flawed chips when news of the problem surfaced in November, the vast majority of Pentium systems being sold still include the flawed chip. NEC says systems with fixed chips will start to ship in volume in January, but most manufacturers point

vaguely to the first quarter of the year.

We were able to get a fixed Pentium chip from Intel in less than a week, and when we posed anonymously as home-office users, Intel's support personnel promised replacements of chips within 4 weeks. The company's support line for Pentium questions (800-628-8686) is set up to direct users to the company's service centers for help replacing their chips, and to the right places to call to get help directly from vendors.

—Sebastian Rupley

■ If At First You Don't Succeed...

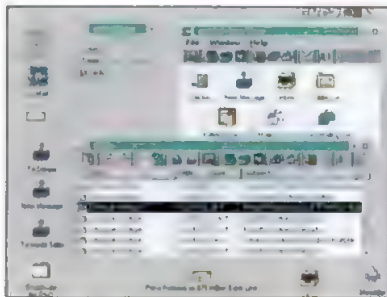
For a while there, convincing Intel to send you a fixed Pentium chip was about as easy as convincing the IRS to give you a year off from taxes. Intel is now honoring all requests for replacements chips, although it does take a few weeks. We were able to get a replacement chip from a major system manufacturer in less than a week. So now that we've seen the new chip, is the FPU fix really a fix?

Our tests showed that it is. PC

Magazine Labs tested our fixed Pentium chip on an HP Vectra XU 90MHz platform, using a series of macros based on ranges of division equations known to result in miscalculations with the flawed chips. There were no errors in our results, proving that the original flawed lookup table was fixed in our chip. Our benchmark tests also showed that the new Pentium chip produced no significant slowdown in performance.—SR

Who's Writing for Warp?

OS/2 WAS GIVEN UP for dead by many industry observers not so long ago, but Warp—the latest version of the operating system—is showing some signs of life. Microsoft's announcement that Windows 95's ship date has slipped until August may pry open the window of opportunity for IBM, which has sold 800,000



Bucking the "go slow" trend, Lotus has a native OS/2 version of SmartSuite.

copies of the new 32-bit operating system (IBM says there are 7 million copies of OS/2 in use today). Warp may have trouble capturing much of the corporate personal productivity market, but the program could make inroads in two specific areas. It provides a stable, powerful platform for internal corporate applications development, and it could very well catch on in the rapidly expanding small office/home office market.

Personal productivity—dominated by Lotus, Microsoft, and Novell/WordPerfect—is likely to remain a Windows world. Of the major office suite publishers, only Lotus offers a native OS/2 product, Lotus SmartSuite. WordPerfect discontinued development of WordPerfect for OS/2 because sales did not support development costs. "It was strictly a financial decision, and a difficult one," says a WordPerfect spokesperson.

Analyst Chris Le Tocq of the research firm SoftTracks agrees that many personal productivity software companies will have little to spend on OS/2 development. "I don't think it's going to happen," he says. "With the need to develop for Win32 and OLE, these developers have a lot on their plate already."

Instead of developing a native OS/2 version of WordPerfect 6.1 for Windows, WordPerfect has created tools that integrate its Windows word processor into the OS/2 environment. The tools are sold separately, for a nominal fee, and deliver the same level of integration as was provided by the native OS/2 version of WordPerfect 5.2. The company will develop similar tools to integrate other WordPerfect products into the Workplace Shell "as appropriate," according to the spokesperson.

Bucking the "go slow" trend is Lotus, which first unveiled an OS/2 version of Lotus 1-2-3 in 1989. The company offers a

complete, native OS/2 version of its SmartSuite package. Product manager Yuko Takagi says the Windows 95 and OS/2 versions of the next major revision of Lotus SmartSuite will share an identical 32-bit code base, have identical feature sets, and share a common file format, allowing OS/2 desktops to fit seamlessly into SmartSuite offices running both Windows 95 and OS/2.

OS/2's role in corporate America is like-

ly to be as a platform for internal development. Le Tocq confirms that OS/2 is increasingly seen as "a good, reliable platform for corporate development." Buck Bohac, president of Indelible Blue Software, agrees. "When you see a company buying thousands of OS/2 licenses, they aren't buying them to run personal productivity apps, but to support vertical applications written in-house." Borland International's recent announcement of an OS/2 version of its C++ compiler could very well further this trend.

Corel Corp. is also betting on Warp as a successful platform for the small office/home office. The company is developing a software suite—called Corel CD Office—aimed at this particular market. Versions for both Windows 95 and OS/2 are tentatively slated to ship later this year.

—Jonathan Karl Matzkin

Cybermall Meets DigiCash

WHEN YOU'RE IN A VIRTUAL SHOPPING mall, what type of tender do you use? Why, virtual cash, of course. As the Internet goes commercial, related industries are gaining players, too: virtual currency providers.

The ubiquitous substitute for paper-based currency—the credit card—loses its luster in cyberspace. On-line, credit cards mean overhead and security risk. Shikhar Ghosh, CEO of Open Market—which lists more than 1,300 virtual stores—says that despite encryption, credit cards aren't efficiently protected on line. He says "tremendous overhead comes from the complex authorization and security routines required, and on-line transactions produce all kinds of customer service problems for card issuers and acceptors."

A growing army of currency and credit go-betweens require your credit card information only once, and protect it. Then they use their own identification schemes (Open Market keeps the names of participants' pets on file) to authorize any financial transactions you make. First Virtual Holdings profits from e-mail-based transactions. The company uses its Internet Payment System to verify all electronic transactions through e-mail-based IDs. Shoppers register for \$2; sellers pay 29 cents per mail-based transaction, and 2 percent of charges.

First Virtual's business strategy is analogous to owning the postal service, while Amsterdam's DigiCash's strategy is more like owning the Federal Reserve. Users can download DigiCash's E-Cash client software from the World-Wide

Web (www.digicash.com). After entering their credit card data, users are issued virtual cash—recognized as currency by more than 15 trial-run virtual merchants.

Electronic Publishing Resources (Sunnyvale, California.) is taking a

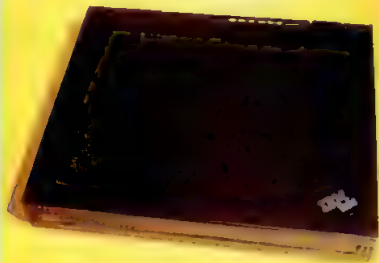
more ecumenical approach by developing tools that allow third parties to invent their own electronic currencies, complete with authentication schemes for security.

Some bigger players are focused on financial transactions in cyberspace, and at least one is convinced the Internet isn't the only place to shop. CommerceNet Consortium, a non-profit corporation subsidized by the government, has started a Payment Services group to facilitate a "financial infrastructure supporting Internet remittance mechanisms." Visa and Microsoft are working together to allow direct payments on the Microsoft Network, the on-line service built directly into Windows 95.

One thing's for sure: Money and accepted equivalents are powerful assets to own. —Sebastian Rupley



■ IBM's Butterfly: *An End to the Cramped Keyboard*



One of the compromises of a subnotebook has always been a keyboard that's too cramped. IBM is designing its latest ThinkPad, the 4-pound

"Butterfly," with a keyboard that extends to full size when you open the case. Close the case, and the keyboard folds up.

Multifunction PC Cards Do It All

MOST OF TODAY'S NOTEBOOK PCs have only one or two PCMCIA slots, and that's not enough as the need for modem, network, sound, SCSI, and storage cards continues to grow. One solution is to add slots, but that increases the size and weight of the notebook and decreases battery life. So manufacturers are turning to another approach: designing multiple functions onto a single card.

Last year, Xircom introduced an Ethernet/modem card, and today, more vendors are starting to talk about innovative combinations such as an ISDN/modem card from IBM, an audio/SCSI card from New Media, a modem/pager from Novalink Technologies, and an audio/video capture device from I/O Magic.

It turns out that chip manufacturers are doing a great job of reducing the size and power requirements of their new devices, making it relatively easy for PCMCIA vendors to fit multiple functions on a single card. Chip-on-board and tape-automated-bonding packaging allow manufacturers to save real estate by using bare chips. In some cases, the same chip can be used for two functions. For instance, audio/modem cards can use a common DSP, which reduces size, weight, cost, and power consumption.

Routing poses another challenge for manufacturers. High-speed digital lines can easily interfere with low-speed analog signals. Vendors making cards that combine Ethernet and modem functions, for instance, must be careful to keep the signals separated. In most cases, they're migrating from the 4-layer boards used in single-func-

tion cards to the 6-layer boards used in multiple-function cards.

The complexities of today's PC environment make integration difficult. Shared cards also mean shared interrupts and data paths.

To help, the PCMCIA committee will release the PC Card Standard, which combines the old PCMCIA and JEIDA standards with new specifications for multifunction cards, low-voltage (3.3V) support, power management, and a 32-bit interface.

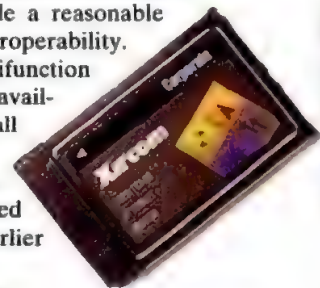
The publishers of card and socket services software are already developing prod-

ucts based on the specification and hope to have software available by the time the spec is officially released in February.

Rather than wait, however, some companies are already shipping multifunction cards.

Before you order your modem/sound/SCSI/ISDN card, remember that it took two years for the PCMCIA spec to provide a reasonable level of interoperability. Usable multifunction cards will be available only if all the committees and vendors have learned from their earlier mistakes.

—Jeff Greenberg



■ PC Cards on Power Conservation Kick

TRUE OR FALSE: DOES A PCMCIA modem draw power from your notebook when you're not using the modem? It sure does, but the latest changes in the PCMCIA standard—known as the PC Card Standard—are designed to minimize the power drain.

In fact, all PCMCIA cards draw power whenever they're plugged in, as there's always power going to the slot. "Even when the modem is in a sleep mode, it's consuming power," explains Bob Yckmat, senior product manager for PCMCIA products at US Robotics. The power drain for most PCMCIA modems adds up to just a few minutes of

battery life, but V.34 modems inherently draw more power.

The new PC Card Standard is designed to minimize the power drain in two ways. First, a card compliant with the new standard can take commands from the notebook for suspending and resuming operations; second, the socket and card connector can handle 3.3-volt as well as 5-volt cards. The 3.3-volt devices use about half the power of 5-volt devices since power consumption increases by the square of the voltage.

The new standard also provides for two future voltage levels below 3.3 volts.

—Melissa J. Perenson

Do You Make These Six Common Mistakes On Your Taxes?

Six common mistakes can cause you big headaches on your taxes. An oversight here, an omission there. From unnecessary tax payments to full blown IRS audits—you can end up paying too much ... or worse. But now, using TurboTax® or MacInTax®, you can avoid these simple but costly mistakes:

1 The Arithmetic Error

Today, even the simplest forms contain complex calculations. And with all the late-night scrambling, an innocent mistake could cost you plenty.

2 The Transcription Error

With all those numbers being juggled from schedule to schedule, it's no wonder the figures are so often transcribed incorrectly or entered on the wrong line.

3 The Omitted Form

Even "ordinary" returns require anywhere from six to a dozen forms to complete. It's easy to miss one or end up rushing all over town to find the one you need.

4 The Misinterpreted Instruction

At best, IRS instructions can be tough to understand. At worst they can be mind-boggling. What you need are clear directions in plain English.

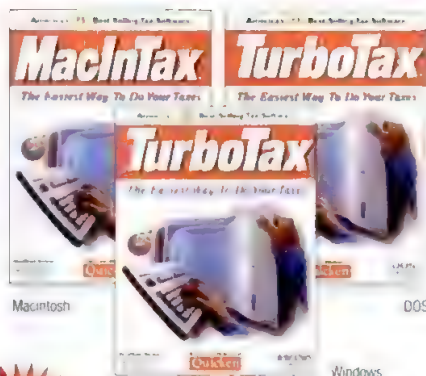
5 The Overlooked Deduction

You'd have to be a professional tax preparer to know all the deductions you're entitled to. If you miss just one, it could cost you hundreds of dollars.

6 The Exceeded Guideline

The fastest way to trigger an IRS audit is to exceed the "normal" range on one of your deductions. You need to know what the IRS looks for on a line-by-line basis.

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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

■ PCs

100-MHz Pentium Desktops: Five Paths to Power

As the speed of today's fastest PCs inches up slightly from 90 MHz to 100 MHz, the ancillary parts of a PC that feed data into and display information from the processor take on increasing importance.

For example, each of the 100-MHz systems reviewed uses the high-performance PCI bus running at 33 MHz—which is 10 percent faster than the bus speed on a comparable 90-MHz Pentium PC. This incremental increase tends to compound the added processing speed.

Apart from this basic equipment, each of the five systems evaluated goes its own way. The Dell Dimension XPS-100 emphasizes its graphics pretensions by including Number Nine's capable 128-bit video card, the Micron P100 Millennium is the first to employ EDO memory chips, the HP Vectra XU

5/100C supports dual processing; the IBM PC 750-P100 includes one of the best software packages available, and the Gateway 2000 P5-100XL seeks to ease the transition to multimedia.

While these systems' CPUs had the floating-point flaw that produces errors in some complex mathematical computations, each manufacturer claimed that it will be shipping



POWER GRAPHICS: With Number Nine's Imagine128 video card, the Dimension XPS P100 suits users who want high resolution.

fixed Pentium chips by the time you read this. Regardless of the individual details, these five systems offer unparalleled performance and a taste of computing in the fast lane.

DELL DIMENSION XPS P100

The Dell Dimension XPS P90 won an Editors' Choice award ("For Love or Money," December 6, 1994) not because it turned in stellar benchmark numbers, but because it offered good performance at a reasonable price. The 100-MHz Dell Dimension XPS P100 is just as feature rich and just as solid a performer. But this model

Continues on page 38

■ Software Suites

PerfectOffice Puts it All Together

BY DAVID HASKIN

When it comes to software suites, the top priorities are the quality of the applications and how well they work together. By both measures, Novell's PerfectOffice 3.0 sets the pace with excellent functionality and superb cross-application support. The result is a suite that leapfrogs the competition by placing its emphasis on tasks, not individual programs.

PerfectOffice Standard, reviewed here, is well worth its \$659 price tag, as it includes Quattro Pro 6.0, WordPerfect 6.1, and WordPerfect Presentations 3.0—all popular programs. In addition, PerfectOffice adds some unexpected treats, including InfoCentral 1.1 (a personal information manager), Envoy 1.0 (a portable-document creator and viewer), and GroupWise 4.1 (a series of client-based groupware products formerly sold as Word-

Perfect Office). But what sets PerfectOffice apart from the pack is not the individual programs themselves, but how well they all fit together.

For one thing, most of PerfectOffice's applications have similar toolbars and menu structures, which greatly simplifies getting started. The only part of the package that marches to its own drummer is GroupWise. While interface consistency is expected in software suites, PerfectOffice's predecessor, Borland Office for Windows, was a confusing mish-mash of interfaces.

FOCUS IS ON DAD

The focal point of PerfectOffice is the Desktop Application Director (DAD), a floating, customizable toolbar from which you launch PerfectOffice's components. Considering the integration tools that are included, DAD is more than Novell's parental answer to MOM

(Microsoft Office Manager). PerfectOffice comes with about 50 QuickTasks—ready-built macros that are launched either from DAD buttons or from a list window. We found that the more useful QuickTasks are those for everyday operations, such as updating PIM records and generating mail merges.

A couple of minor complaints: The QuickTask list isn't sortable, and the dialog boxes for modifying both the QuickTask list and the contents of DAD can be difficult to decipher. You can, however, remove and reorder tasks and toolbar buttons by dragging them out of their window or placing them in another location in the window.

Nontechnical end users can create interapplication QuickTasks with the suite's new keystroke and mouse recorder. While there are no simple error-prevention and debugging tools for nontechnical users, Novell

Continues on page 40

► IN FIRST LOOKS

AutoCAD Release 13.....	42
Fractal Design Painter 3.....	44
RayDream Designer 3.....	46
More PC Tools.....	47
Quarterdeck Clean Sweep.....	47
CPA KX-RC90.....	48
Day to Day Contacts 3.0.....	48
Kodak XLS 8600 PS.....	50
Polaroid SprintScan 35.....	51
PhotoWorks Plus.....	51
Your Mutual Fund Selector.....	54
Sound Forge 3.0.....	54
SameSame 2.2.....	56
Drag And Zip, Version 5.....	56
MyAdvanced Brochures.....	56

Five Pentium PCs

CONTINUED FROM PAGE 37

includes Number Nine Computer Corp.'s high-end Imagine128 video card, and it's priced at \$3,899.

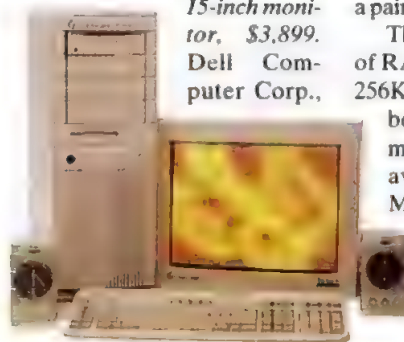
The system came fully equipped, including 16MB of RAM, a 1GB hard disk, 256K of external cache, a CD-ROM drive, and a sound card. The Dimension XPS P100 turned in the kind of test scores we expected to see from a system equipped with a 100-MHz Pentium, but it didn't excel in any one area. Most notable were the Dimension's Winstone 95 (150) and Graphics WinMark 95 (15.0 million pixels per second) results. Both are decent, but not exceptional. We ran our benchmark tests at a resolution of 800 by 600 pixels, because the tests are based on business applications. At higher resolutions and in 24-bit color mode, expect the Number Nine card and the Dell system to stand out.

Like most Dell systems, the Dimension XPS P100's interior was uncluttered and offered easy access to the motherboard.

Overall, it continues the Dimension's tradition of offering inexpensive, well-built, and capable PCs.—*Tin Albano*

► Dell Dimension XPS P100.

List price: *With Pentium/100 CPU, 16MB RAM, 256K external cache, 1GB hard disk, 15-inch monitor, \$3,899.* Dell Computer Corp.,



NICE PRICE: *The Gateway 2000 P5-100XL is perhaps the best value in the PC world's upper echelon.*

Austin, TX; 800-613-3355, 512-338-4400; fax, 800-727-8320.

Circle 417 on reader service card

GATEWAY 2000 P5-100XL

Multimedia is the emphasis in the \$4,299 Gateway 2000 P5-100XL system, which sacrifices ultimate performance in favor of smoothly integrating sight and

sound. Built around a 100-MHz Pentium processor, this system features many unexpected extras, including a quad-speed CD-ROM drive, a 17-inch Vivitron monitor based on Sony's Trinitron technology, a 16-bit wavetable sound card, and a pair of Altec Lansing speakers.

The system came with 16MB of RAM, a 1GB hard disk, and 256K of external cache. On our benchmark tests its performance was slightly below the average of the other 100-MHz systems we looked at, but far ahead of 90-MHz Pentium PCs.

Pure performance misses the point with the Gateway P5-100XL, which comes with an extensive array of preloaded software, including Microsoft Office

Professional and DiagSoft's excellent QAPlus troubleshooting program.

Gateway's 2000 P5-100XL trades a little performance for a good mix of software and impressive multimedia equipment.—*William P. Flanagan*

► **Gateway 2000 P5-100XL.** List price: *With Pentium/100 CPU,*

16MB RAM, 256K external cache, 1GB hard disk, 17-inch monitor, \$4,299. Gateway 2000 Inc., North Sioux City, SD; 800-846-2000, 605-232-2000; fax, 605-232-2023.

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HP VECTRA XU 5/100C

How does Hewlett-Packard improve on its Editors' Choice-winning HP Vectra XU 5/90C ("Pentium Powerhouses," September 27, 1994)? It simultaneously adds a 100-MHz Pentium processor and lowers the HP Vectra XU 5/100C's price to \$4,741.

The Vectra 5/100C comes equipped with the same impressive list of high-performance components that its 90-MHz Pentium sibling offers. Integrated onto the system's motherboard are a graphics accelera-



DOUBLE THE FUN: *The HP Vectra XU 5/100C can accommodate an extra Pentium CPU for a future upgrade.*

■ Gateway 2000's 75-MHz Family PC: *A Little Something for Everyone in the House*

The \$2,499 Gateway 2000 P5-75 Family PC offers more than just an easy entry into the world of Pentium power. It is simple to set up, and includes an array of features and software—offering something for each member of the family.

The unit is built around a 75-MHz Pentium processor and a PCI-based motherboard. The system we reviewed included 8MB of RAM, a 730MB hard disk drive, a double-speed CD-ROM drive, a 15-inch Vivitron monitor, a Creative Labs 16-bit sound card with Altec Lansing speakers, and a 14.4-Kbps fax modem. There is also a good assortment of edutainment software bundled with the unit, including a whole library of Microsoft products: Cinemania, Encarta, Fine Artist, Golf, and Works.

On our benchmark tests, Gateway's Family PC produced respectable performance that

was, overall, somewhere between a 66-MHz and a 90-MHz system. The real reason to consider this machine is not the performance but the fun and features it offers those who want to bring computing into the home.—*WPF*

► **Gateway 2000 P5-75 Family PC.** List price: *With Pentium/75 CPU, 8MB RAM, 720MB hard disk, 15-inch Vivitron monitor, \$2,499.*

Gateway 2000 Inc., North Sioux City, SD; 800-846-2000, 605-232-2000; fax, 605-232-2023.

Circle 422 on reader service card



HOMEOWN FUN: *Gateway's P5-75 Family PC is aimed at the home.*

tor, SCSI-2, and PCI-enhanced IDE controllers, as well as a 32-bit PCI Ethernet networking port. The Vectra 5/100C is easily the best equipped PC on the market today. In addition, its cleverly designed power switch and LED indicators are built into an external panel, which can be rotated so that the case can function as a desktop or a minitower.

Look over the motherboard closely, and you'll find a pair of ZIF sockets: one for the 100-MHz Pentium processor that comes with the system and an

First Looks

empty one for a second Pentium CPU. With the additional Pentium chip and a multiprocessing operating system (such as Microsoft Windows NT 3.5 or OS/2 for symmetric multiprocessing), users can get a performance boost. While this feature may seem like CPU overkill right now, it may well be the best upgrade path for the future.

The Vectra 5/100C's performance was not disappointing. Its Winstone 95 score of 161 was a close third behind the Micron and IBM systems, and the Vectra 5/100C's Graphics WinMark 95 score of 17.3 million pixels per second was the best of this group.

With its excellent design and solid performance, the HP Vectra XU 5/100C shows both the present and future tense of personal computing.—TA

► **HP Vectra XU 5/100C.** List price: *With Pentium/100 CPU, 16MB RAM, 512K external cache, 1GB hard disk, 17-inch monitor, \$4,741.* Hewlett-Packard Co., Palo Alto, CA; 800-322-4722, 415-857-1501; fax, 800-333-1917.

Circle 419 on reader service card

IBM PC 750-P100

The combination of a flexible design, a host of productivity tools, and stellar performance make the \$5,971 IBM PC 750-P100 a system to please even the most demanding user.



POWER PACKAGE: The IBM Personal Computer 750-P100 combines high-end performance with a large selection of useful software.

The key is IBM's innovative SelectaBus architecture, which puts the bus circuitry on a riser card. You can choose either a Micro Channel or PCI-bus architecture at the time you purchase your unit, and if you change your mind, just replace the riser card.

The PC 750-P100 also simplifies system management. It is Plug-and-Play-ready and comes with its own software utility to make hardware installation a snap. You also get DiagSoft's QAPLUS diagnostic software; Online Housecall, for remote troubleshooting; and NetFinity LAN-management software.

A great selection of productivity tools is included; using the Rapid Resume Manager, the PC 750-P100 starts up where you left it when you last powered down. You can program the PC to turn on or off, run a program, or display a message at a partic-

With Pentium/100 CPU, 16MB RAM, 1MB external cache, 1GB hard disk, 17-inch monitor, \$5,971. IBM Personal Computer Co., Somers, NY; 800-426-2968. Circle 420 on reader service card

MICRON P100 MILLENNIA

Micron, one of the world's premier semiconductor manufacturers, shows its technological emphasis with the P100 Millennium. The first system to contain extended data out (EDO) memory, the P100 Millennium sets a bunch of new records for both performance and value.

Even with this expensive technological edge, the P100 Millennium sells for less than \$4,000. It is priced like a value-oriented PC, but it comes equipped like a high-end PC: 16MB of RAM, 1GB hard disk, 17-inch monitor, quad-speed CD-ROM drive, and sound

to Micron's trailblazing use of EDO memory chips, which keeps the contents of the system's memory



MEMORY MAVEN: The Micron P100 Millennium is the first to use EDO memory chips, which adds to its stellar performance.

available to the processor longer. There was a slight but noticeable performance improvement; EDO is expected to be used on a variety of systems as it becomes more available.

The Micron P100 Millennium

Benchmark Tests: 100-MHz Pentium PCs



Each of the tested 100-MHz Pentium desktop systems generally produced benchmark test scores higher than PCs with 90-MHz

processors—by a larger margin than could be predicted on the basis of the processor's increased clock speed. Standouts were the Micron P100 Millennium's unprecedented Winstone 95 score and high

CPUmark₁₆ score, and the HP Vectra XU 5/100's CPUmark₁₆ score.

PC Magazine Labs used Winstone 95 (Version 1.0), WinBench 95 (Version 1.0), and PC Bench (Version 9.0) to measure the performance of these desktop PCs. Each was equipped with 16MB of RAM

Higher scores represent better performance.

	Winstone 95 (score)	Graphics WinMark 95 (million of pixels per second)	Disk WinMark 95 (score)	DOSMark (score)	CPUmark 16 (score)	DOS Video (score)	DOS Disk (score)
Dell Dimension XPS P100	150	15.0	773	839	207	1,941	666
Gateway 2000 P5-100XL	145	14.4	690	1,018	208	4,432	697
HP Vectra XU 5/100C	161	17.3	801	755	222	1,229	723
IBM PC 750-P100	163	14.2	901	1,076	216	3,956	799
Micron P100 Millennium	177	16.5	916	1,155	221	5,280	826
Average 90-MHz Pentium PC	115	12.0	604	907	186	4,124	640

ular time. And it will even wake up to receive a fax.

The system, which was tested with a 17-inch monitor, 16MB of RAM, 1MB of external cache, and a CD-ROM, proved powerful. The PC 750-P100's Winstone 95 score of 163 was rivaled only by the HP and Micron units.

Despite being priced several hundred dollars above the other four 100-MHz Pentium PCs, the IBM PC 750-P100 is worth every cent.—Jodi L. Wynblatt

► **IBM PC 750-P100.** List price:

card.

The result is a powerful computer that does not skimp on performance. Based on our benchmark tests, the P100 Millennium is nothing short of the most capable PC we've ever seen. Its Winstone 95 score of 177 is more than 10 percent higher than the average score of the other 100-MHz systems, and more than 50 percent higher than the 90-MHz Pentium average.

This is partially attributable

seemingly does the impossible. It squeezes the last bit of performance out of Intel's Pentium processor and does it at a very reasonable price.

—Brian Nadel

► **Micron P100 Millennium.** List price: *With Pentium/100 CPU, 16MB RAM, 256K external cache, 1GB hard disk, 17-inch monitor, \$3,995.* Micron Computer Inc., Nampa, ID; 800-388-6334, 208-463-3434; fax, 208-463-3424.

Circle 421 on reader service card

PerfectOffice 3.0

CONTINUED FROM PAGE 37

does simplify matters by adding Experts, which—like Microsoft's Wizards—walk users through the creation of QuickTasks.

PerfectScript starts where the QuickTasks leave off. An extension of the WordPerfect macro language, PerfectScript is the glue that binds the suite's applications together. It can control any of the package's six applications directly, and can also nest scripts from other applications (even from Microsoft Excel and Lotus 1-2-3 for Windows).

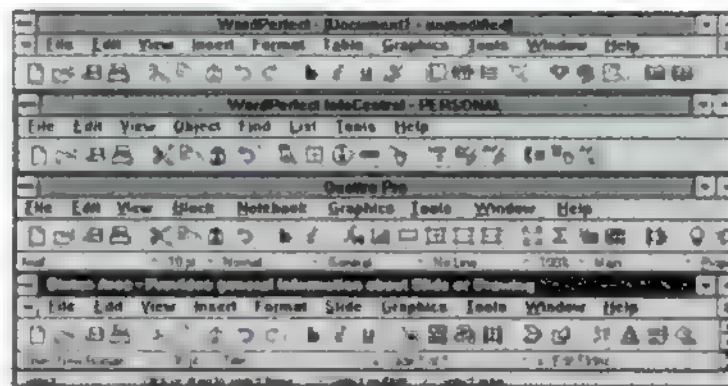
The fact that these macros cross over applications gives PerfectOffice a strong task-oriented feel, as opposed to Microsoft Office's program-centric orientation. For example, we wrote a PerfectScript macro that updated a Quattro Pro profit and loss statement, inserted the bottom-line figure into a WordPerfect memo, and distributed the memo via GroupWise e-mail. This level of integration lets the user focus on the specific task at hand, not the individual applications needed to accomplish it.

In addition, developers can take advantage of the PerfectScript language and WordPerfect's custom dialog-box builder to create custom environments for a wide variety of end users. These customization capabilities are particularly powerful when used in combination with aids like Quattro Pro macros and WordPerfect automatic templates. Furthermore, QuickTasks and PerfectScript scripts can perform most NetWare 3.x and 4.x tasks, such as logging on to servers.

HAND HOLDING

Novell uses Experts extensively in Quattro Pro and for initial presentation creation in Pre-

sentations. While the AutoContent Wizard in Microsoft's PowerPoint concentrates on content, the Experts in Presentations focus on purpose—such as how to convince a skeptical audience. Both are valid approaches, but Presentations adds an extra edge. PerfectOffice also has Coaches for major operations; these helpful



COMMON LOOK: Unlike its predecessor, Borland Office, PerfectOffice features applications that have similar toolbars and menu structures.

guides explain how to accomplish tasks without actually doing them for the user. (Presentations will be the subject of a First Looks review in the near future.)

PerfectOffice applications, like those that are found in Lotus SmartSuite and Microsoft Office, share common code modules (such as spelling and grammar checkers). But here PerfectOffice goes a step further than the competition. For example, QuickCorrect, the package's on-the-fly spell-checker, works in both WordPerfect and Presentations. In contrast, Microsoft's AutoCorrect feature works only in Word for Windows and not in Microsoft Office's other applications.

In addition, many common dialog boxes (such as those for Open and Save) are in shared



PICK A TASK: With QuickTasks, you can launch even complex cross-application tasks simply by clicking on a button in the list window.

DLLs. Several of the shared dialog boxes also have a Network button. By simply clicking on that button with their mouse, users can accomplish basic network tasks without leaving their application.

All of the PerfectOffice applications share WordPerfect's excellent indexing, retrieval, and document management capabilities, which Novell has grouped together and renamed QuickFiles. The ability of QuickFiles to assign nicknames to paths further enhances the suite's task-oriented feel. For example, we were able to store a variety of budget documents—including WordPerfect memos, Quattro Pro spreadsheets, and an Envoy digital document—

in a directory called 1995 Budget Documents, regardless of which applications originally created them.

Further strengthening PerfectOffice's integration is the ability of most of its applications to serve as both OLE 2.0 clients



POINT AND GO: The focal point of PerfectOffice 3.0 is the Desktop Application Director (DAD), which leads you to all the programs in the suite.

and servers. This enabled us to drag and drop information between the different applications and to take full advantage of OLE's powerful edit-in-place capabilities. The exceptions to universal embedding and linking are InfoCentral—which can serve as an OLE 2.0 client only—and Envoy—which supports OLE 1.0.

SLOW GOING

While OLE makes data integration nearly seamless, it comes at the price of performance. Unless your PC has a Pentium processor and a lot of RAM, you'll wait as OLE works behind the scenes.

Information sharing is

another area in which PerfectOffice makes some significant strides. By including Envoy, workgroups can create and access electronic documents. Only Lotus SmartSuite, which includes the SmartText electronic publishing application, comes close to this capability; Microsoft Office doesn't even include a digital publishing package.

Further, because PerfectOffice supports Borland's Object Exchange (OBEX) technology, a document creator can publish a document on the network and assign reading and writing rights to various users. This feature is potentially a boon for collaborative authoring projects.

DECISIONS... DECISIONS

Finally, there is also PerfectOffice Professional Edition to consider. In addition to the elements of PerfectOffice Standard Edition, this souped-up package adds Paradox 5.0 and Visual AppBuilder 1.0. PerfectOffice Select—due to ship by spring—adds more groupware products (including the SoftSolutions document-management system) and consumer products (including ExpressFax from WordPerfect Main Street). More

notably, though, PerfectOffice Select will let you assemble your own customized suite—you simply pick and choose from a menu of applications and pay only for the products you need.

All told, PerfectOffice delivers an excellent array of programs and unparalleled integration. It represents a significant advance for software suites.

► **PerfectOffice 3.0 Standard.** List price: \$659; upgrade from previous versions, \$199 (until March 31, 1995); competitive upgrade, \$239. Requires: 8MB RAM, 40MB hard disk space, Microsoft Windows 3.1 or later. Novell Applications Group, Orem, UT; 800-321-4566, 801-225-5000; fax, 801-222-5077.

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Mike Gardner, Randy Solton, Lloyd Tabb, Bruce Bundy, Ken Smith, Ray Kluchi, Peter Johnson, Liz Stevenson, Charles Overbeck, Steven Chau, Hin Boen, Kevin Brown, Wayne Davison, Bill Joy

TOOLS DEVELOPERS ARE ALWAYS TALKING UP THE VIRTUES OF object orientation, but dBASE 5.0 for Windows was one of the few products this year to deliver the goods. Its solid object model and productive visual tools are a case study in why we're moving toward objects.

Perhaps its most impressive new feature is two-way visual tools. These let programmers move seamlessly between creating an interface with visual painters and editing a source code representation of the same interface. Changes to the source code are automatically reflected in the visual object and vice versa. Interface objects incrementally resolve to code as you save your work, and you can look at or edit the code at any time. Borland's release of a visual, fully object-oriented successor to dBASE for DOS marks an impressive turnaround for this classic PC product. It also gives an estimated 6 million dBASE users entry into the world of visual, object-oriented development.



dBASE IS dBEST. AGAIN.

dBASE 5.0 for Windows.

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CIRCLE 281 ON READER SERVICE CARD

Computer Aided Design

AutoCAD 13: Faithful to Past, Present, and Future

BY JEFF PROSISE

Deciding whether to upgrade your faithful DOS programs to Windows can be difficult. This is especially true for CAD users whose DOS habits die hard. Autodesk's \$3,995 AutoCAD, Release 13, the latest in a long line of updates, provides a practical solution to this dilemma by offering something for everyone.

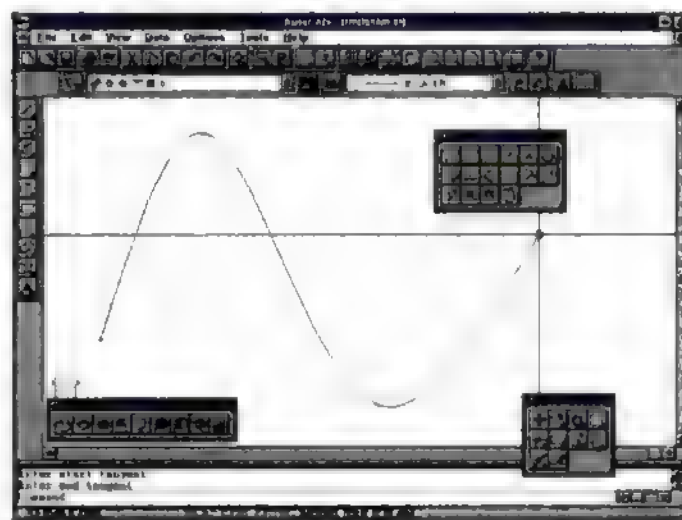
Release 13 marks a milestone in the evolution of AutoCAD: The program now supports multiple platforms right out of the box. You can install AutoCAD for DOS, AutoCAD for Windows, or AutoCAD for Windows NT (the NT version should be ready by the time you read this). Release 13 also marks the first time that AutoCAD has been offered on CD-ROM (at a price \$245 less than the floppy disk version). Further, the program now installs in minutes, and includes searchable documentation for Windows and Windows NT users.

THE FUTURE OF CAD

AutoCAD for Windows is an up-to-date 32-bit application that gives users a peek at the future of computing. To run it with Windows 3.1 or Windows for Workgroups, you must first install the included Win32s library, which converts 16-bit Windows into a 32-bit platform with many of the features of Windows NT.

New features common to both the DOS and Windows versions of the program include a treasure chest for the PC-based designer: support for Non-Uniform Rational B-Spline (NURBS) curves, unbounded construction

lines stretching to infinity in one or both directions, thumbnail-size drawing previews when opening files, and snapping to



HANDY TOOLBARS: Floating, dockable toolbars provide one-click access to most AutoCAD commands.

extended intersections (the location where entities would intersect if they were extended).

Not only does Release 13 include a spell-checker and support for paragraph-oriented text editing, but it also supports TrueType fonts—noteworthy in a Windows product but nothing less than remarkable in a DOS product.

Solid modeling is now integrated into AutoCAD. Autodesk's AME has been replaced

by a solid modeler based on the ACIS kernel. Longtime AutoCAD users will be relieved to know that existing AME solids may be converted to the new format. The ACIS modeler lets you start with included primitives (such as cones, cylinders, and spheres), or with your own geometric primitives. Then you can combine them with Boolean operators and even extrude along spline paths—one of the benefits of NURBS support.

The resulting solids may then be given material properties and rendered in up to 256 colors using flat, Gouraud, or Phong shading. Output may be saved in a variety of file formats or exported to other Autodesk products—such as 3D Studio or AutoVision—for further processing (Release 13 comes with a version of AutoVision that is

good for 30 days). The downside is that the renderer is a resource hog. We found that 80MB or more of combined physical and virtual memory were required to render a complex figure. We also experienced severe disk thrashing while rendering a complex model with AutoCAD for Windows on a PC with 24MB of RAM. The

bottom line is that despite Autodesk's minimum requirement of 16MB of RAM, plan on having 32MB or more for rendering.

AN OBJECTIVE WORLD

Not surprisingly, AutoCAD for Windows and AutoCAD for Windows NT include a few features that AutoCAD for DOS does not. Chief among them is object linking and embedding (OLE) support. The Windows versions can play the roles of OLE clients and servers, permitting AutoCAD drawings to be embedded in other documents and vice versa. On the other hand, the program cannot have more than one drawing open at any given time—an omission that may prove prescient on Autodesk's part, given that the multiple document interface will be de-emphasized in Windows 95 and may eventually disappear altogether.

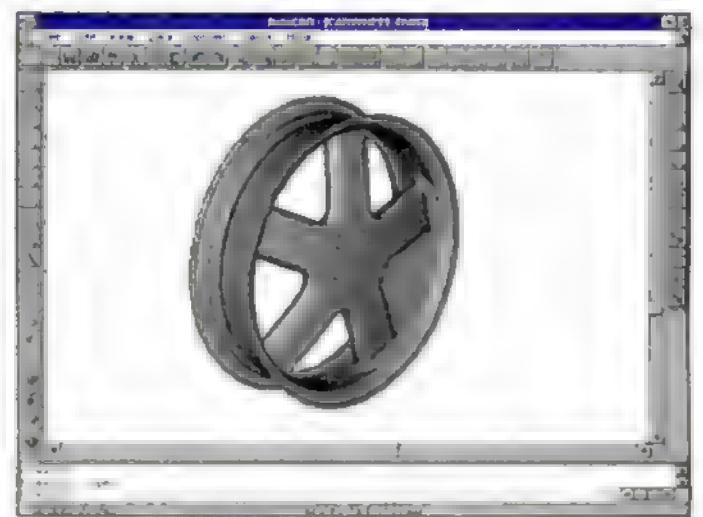
While the DOS version retains the traditional look and

feel of AutoCAD, the Windows and Windows NT versions take it to a new level. Overhead menus have been simplified, with most drawing commands now accessible via floating, dockable toolbars.

The toolbars themselves are highly customizable and display small explanatory text windows when the pointer hovers over a button for a second or two. You can even build toolbars of your own. Commands may still be typed, menu-selected, or entered from a digitizing tablet. Customized menus—long a power tool for serious AutoCAD users—may now be merged with existing menus.

AutoCAD, Release 13 raises the mark for Windows-based CAD users, but not at the expense of DOS users, who will find the program as familiar as an old friend. Whatever your platform preference, you won't be disappointed.

► **AutoCAD, Release 13.** List price: \$3,995; CD-ROM version, \$3,750; upgrade from Release 12, \$495; upgrade from earlier releases, \$695. AutoCAD for DOS requires: 12MB RAM, 25MB hard disk space, DOS 5.0 or later. AutoCAD for Windows



DRAW IT AS YOU SEE IT: Models can be rendered in up to 256 colors using flat, Gouraud, or Phong shading.

requires: 16MB RAM, 35MB hard disk space, Microsoft Windows 3.1 or later. AutoCAD for Windows NT requires: 32MB RAM, 35MB hard disk space, Microsoft Windows NT 3.5. Autodesk Inc., San Rafael, CA; 800-964-6432, 415-507-5000; fax, 415-507-5100.

Circle 411 on reader service card



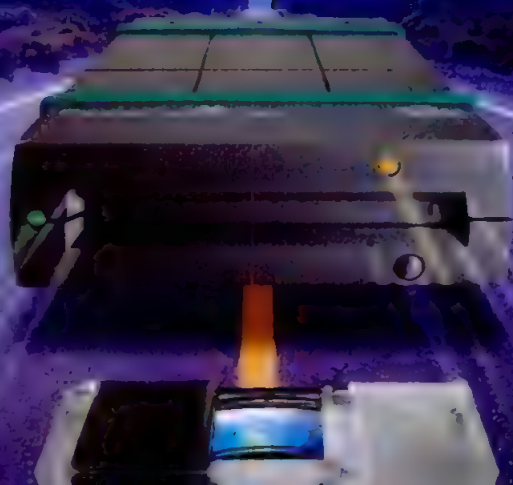
From February 6 through 10, you can go on-line to discuss AutoCAD, Release 13 with AutoCAD product executives from Autodesk, hosted by PC Magazine contributing editor and reviewer Jeff Prosis. Type GO EXEC at any CompuServe! prompt.

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■ Illustration Software

Painter 3 Aims High and Low

BY LUISA SIMONE

Seeking to appeal to a broader audience, Fractal Design is pushing its Painter 3 illustration program into new territory. With added image-editing capabilities and a plethora of new features, Painter remains a high-end professional illustration tool that artists can't live without. At the same time, Painter 3 borrows a lot from Fractal Design's entry-level Dabbler program.

The big changes in the \$499 Painter package include a new interface, innovative tools, and a laundry list of enhancements. But two things haven't changed: a deep-seated respect for the nuances of traditional art media and methods, and an infectious enthusiasm for eye-popping image-editing effects.

Painter 3 is more intuitive than ever because several of the program's new functions mimic conventional art processes. One of the most intriguing new features, the Frame Stack, is based on old-fashioned animation techniques. It allows you to overlay up to five layers of transparent sheets and trace images from one frame to the next, altering each slightly. By employing Painter's other tools in combination with Frame Stacks, you can recreate the nostalgic look and feel of a pencil test animation.

The downside is that Painter 3's fidelity to traditional frame-by-frame methods can be time-consuming and arduous work. We found that the only way to automate this process was to apply a previously recorded work session to all of the frames in a new movie.

WEAVE A FILL

Experienced textile designers will feel immediately at home with Painter's virtual loom—a module that allows you to weave fill patterns resembling fabric. We created a complex pattern by choosing a weft and warp combination, and by adjusting the thickness and color of the fibers. Unfortunately, inventing your own weaving patterns requires you to learn the loom's programming language.

In contrast, the new Image Hose tool has absolutely no conventional counterpart in the art world. Instead of using brush strokes, we were able to paint an image directly onto the program's canvas. It is as easy as choosing a series of images—which Painter calls a *nozzle*—and swabbing the page with the image. Generating your own nozzles can be either complicated or straightforward, depending upon the creation method you choose. You can arrange a series of pictures in a grid, group several different floating selections together, or convert a digital video clip into Publisher's native .RIF format.

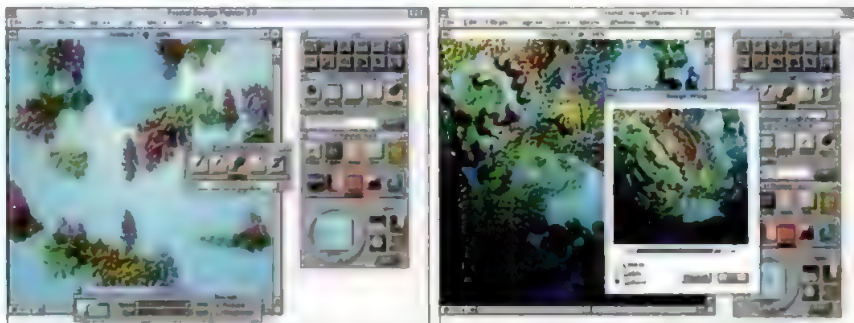
If you find inspiration in new tools and techniques, you'll love Painter, because it can now reproduce the striations and color variations of bristle brushes much more realistically. Several new brush vari-

ants—like Big Loaded Oils—take advantage of this technology to produce startlingly naturalistic brush strokes. The new gradient fill options, which include unusual “ramps” (which look like a spiral) and the ability to map a gradient to a picture's luminance values, promise to produce a whole new generation of Peter Max wannabes.

The most impressive new painting mode is called—rather confusingly—Capture Pattern. It

of drawers that open and close, palettes that expand and contract, and brush configuration options that are split across several different control palettes.

Painter's \$499 price tag is justified by the inclusion of object layering functions that were previously available only in Painter X2—a \$149 add-on. One of the most elegant implementations of object layering around, it provides robust object-management functions (such as grouping),



START TO FINISH: After selecting an Image Hose nozzle, Painter's Small Random Spray swabs the image on the screen (left), producing the outlines of a complex illustration. You can then use the Image Warp special effect to modify and distort the original (right).

intricately wraps color to the opposite side of the picture whenever you paint off the edge of the canvas—creating a seamless repeating pattern. And the new Image Warp filter lets you push or pull the surface of a picture to create fun-house mirror effects.

LITTLE BIG CHANGES

The smallest enhancements ultimately deliver the biggest productivity gains. For example, adjusting brush size while you paint by using a keyboard shortcut is an enormous time-saver. The ability to draw selection areas using editable Bezier curves or to adjust the feathered edge of a mask using the HSV slider bring Painter's selection tools up to par with dedicated image-editing products like Adobe PhotoShop.

The program's revamped interface arranges all of the painting tools and art materials into drawers—an organizational metaphor borrowed from Fractal Design's Dabbler. Because Painter is a more complex program than Dabbler, the result is a sometimes confusing collection

sophisticated compositing options (such as gel or colorize) and automated effects (such as the new drop shadow effect). As a bonus, Painter 3 includes a CD-ROM filled with stock photographs, sample movie clips, paper textures, Image Hose nozzles, and brush looks.

Ironically, several useful features present in Painter 2—including the ability to export .EPS files with a clipping path and the ability to tear off a single brush variant from the brushes palette—have been dropped from Painter 3; hopefully, they'll reappear in the next version. In the meantime, no one will be disappointed with Painter 3—this is a program for anyone who is interested in making serious art or having serious fun.

► **Fractal Design Painter, Version 3.** List price: \$499; upgrade from Painter 2, \$149. Requires: 8MB RAM, 10MB hard disk space, Microsoft Windows 3.1 or later. Fractal Design Corp., Aptos, CA; 800-297-2665, 408-688-5300; fax, 408-688-8836.

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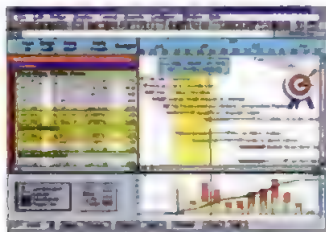
From February 13 through 17, you can go on-line to download a demo of Fractal Design Painter 3 or to discuss it with Fractal Design founder and CEO Mark Zimmer, VP of marketing Steve Guttman, and PC Magazine contributing editor and reviewer Luisa Simone. Type GO EXEC at any CompuServe prompt.

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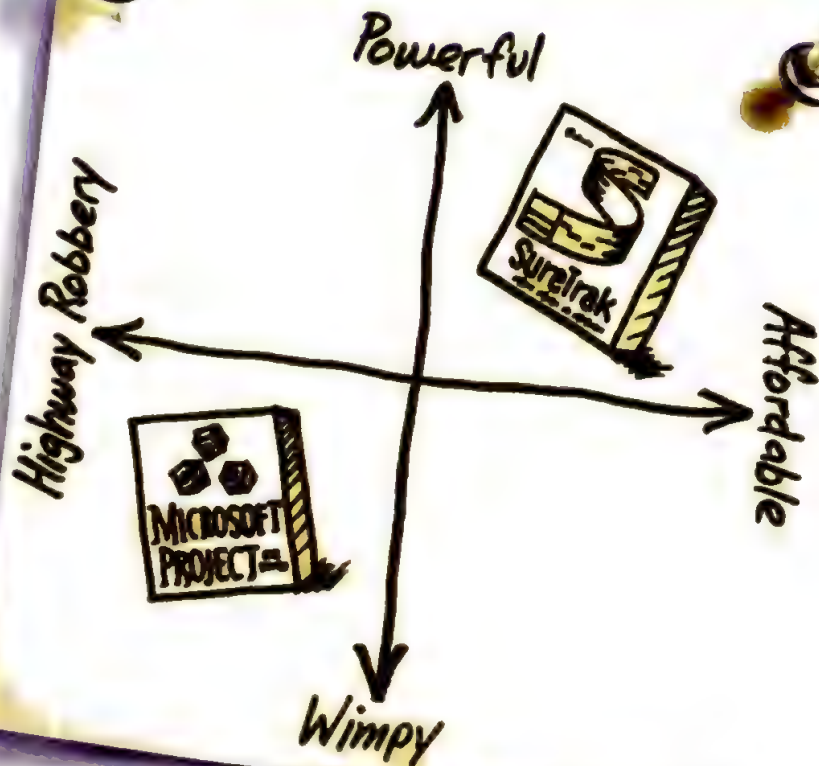
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■ 3-D Illustration

Ray Dream Designer Can Draw What You Dream Up

BY DANIEL GROTTA AND
SALLY WIENER GROTTA

Originally developed for the Macintosh, Ray Dream Designer now moves to the Windows platform, bringing with it the program's renowned power, ease of use, and intuitive interface. Ray Dream Designer 3 (\$349) is an economical path to professional-looking, three-dimensional still images.

Although installation was simple and trouble-free, producing 3-D images is a complex business. Even a rudimentary understanding of the program should consume from a few hours to a few days. Luckily, Ray Dream's tutorial does a good job of covering all the basics of the program, as well as its 3-D nomenclature (which may be unfamiliar to new users).

The first problem is to capture and represent three dimensions on a two-dimensional monitor. Traditionally, this has been done with odd-looking and hard-to-understand wireframe representations. Ray Dream does away with wireframes (though they are a preview option) by using realistic-looking objects with color and shading, which can be sized, aligned, rotated, and otherwise manipulated. We found the result to be a more intuitive feel for the drawing we were creating.

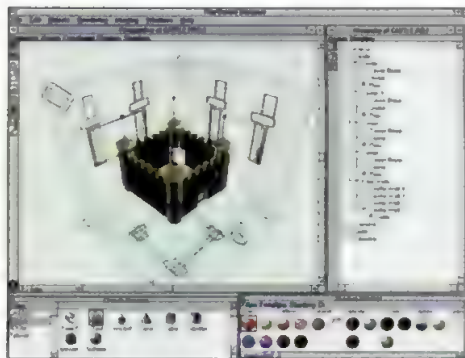
Ray Dream makes full use of drag-and-drop technology, an open plug-in architecture, and highly customizable tools. Together, these give the program a wide array of options and features.

The program's key windows are Perspective, Hierarchy, Modeling, Object Browser, and Shaders Browser.

WINDOWS ON A 3-D WORLD

Perspective is where the 3-D scene starts. The Hierarchy window keeps track of the objects placed in the scene, while the Modeling Window is where shapes are molded. We found it remarkably simple to customize 3-D objects, create others from scratch, or base new ones on vector shapes imported from other programs. The Object Browser stores basic 3-D shapes (cone, sphere, text, cube, cylinder, free form, or icosahedra), as well as libraries of 3-D clip art. The Shaders Browser holds colors and textures and contains one of the best and most powerful shading editors we've seen.

Since even a complex 3-D scene is really just a compilation of simple geometric objects that are covered with textures, colors, and shading, Ray Dream provides all the elements for building entire three-dimensional worlds. For instance, we modeled a snowman by combining three



BUILD FROM SCRATCH: Even complicated 3-D images can be built from simple geometric shapes to which lighting and surfaces are eventually added.

spheres (for the head and body), a cone (the carrot nose), and a tall and a flat cylinder sitting atop each other (the top hat), then covered it with a rough, white coat to represent snow.

Among Ray Dream's more innovative features are its 3-D brushes, which allow the painting of a surface with either rectangular, elliptical, polygonal, or free brush strokes. On the other hand, Ray Dream's Fog Atmosphere effect was extremely difficult to master. Its use requires some sophisticated mathematics, but can add a needed sense of distance and photo-realism to 3-D scenes.

Lights and cameras are necessary in any 3-D program to establish illumination and perspective. Ray Dream's highly customizable lights (Ambient, Distant, Spot or Bulb) and cameras provide a wide range of features that lend a professional level of finesse and control. Once an illustration is defined, all we had to do was render it to create a usable and realistic looking scene.

SLOW GOING

It took us about a half-hour on a 486DX2/66 PC with 64MB of RAM to render a 4- by 3-inch, 72 dot-per-inch resolution scene consisting of two lights and six groupings of objects. More complicated scenes can take hours.

To eliminate mistakes before rendering, Ray Dream has several pre-

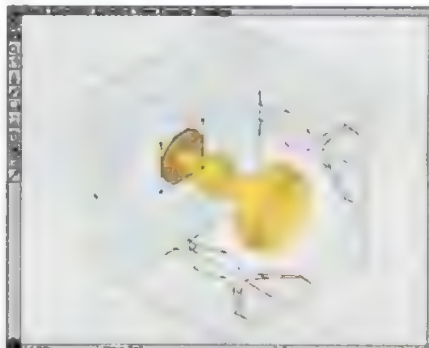
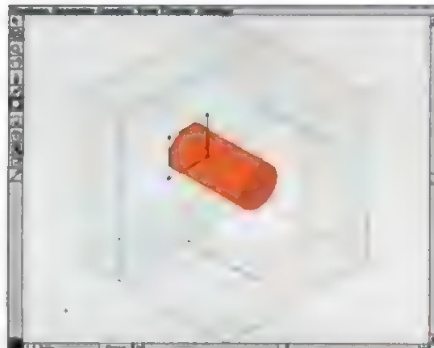
view modes: Basic Preview gives shape and coarse color information; the appropriately-named (but slower) Better Preview shows bumps, highlights, surface shading, and color variations. Render Preview includes reflections, refractions, and shadows.

The only major drawback to the program was that it produces only still images. To create eye-popping animated 3-D work requires a more sophisticated and expensive product along the lines of Autodesk's 3D Studio.

Ray Dream delivers with a powerful, feature-rich 3-D modeling program that raises the bar on software targeted to the professional and amateur artist.

► **Ray Dream Designer, Version 3.** List price: \$349. Requires: 8MB RAM (12MB recommended), 28MB hard disk space, Microsoft Windows 3.1 or later. Ray Dream Inc., Mountain View, CA; 800-846-0111, 415-960-0768; fax, 415-960-1198.

Circle 403 on reader service card.



ONE, TWO, THREE: Ray Dream gives you nearly unlimited control over creating shapes. Start with a circle on a 3-D grid that is extruded into a cylinder (left), and use the Bezier tool to shape the outline of a goblet (right).

■ Uninstallers

CleanSweep Picks Up After Windows

BY J. W. OLSEN

Quarterdeck Office Systems has joined the long line of vendors who have thrown their hats into the ring of Microsoft Windows uninstaller utilities. Its \$59.95 CleanSweep for Windows covers most of the expected bases but can prove frustrating to use and is not as complete as other, similar products, particularly Vertisoft's Remove-IT.

CleanSweep provides commendably diverse ways to remove unwanted leftover files. The program is organized under four icons: Uninstall removes components of a specific program or Program Manager program group; System removes wallpapers, fonts, screen savers, and seven other categories of Windows and DOS files; Find Dups sleuths out duplicate files that are hogging hard disk space; and Find Unused removes help files, archives, temporary or backup files, and more. You also can use Find Unused to search for user-definable filename masks such as *.TMP.

We found that CleanSweep's interface is invitingly simple while offering a variety of options. The "trial run" feature—a simulated purging of files—is an effective way to see the results of your actions before actual deletion. Even more importantly, you'll appreciate that you can choose whether to back up deleted files, and whether these archives are compressed using the popular PKZIP program. You can choose whether to be queried before each deletion, and you can save a permanent log of deletion actions.

SLOW CLEAN-UP

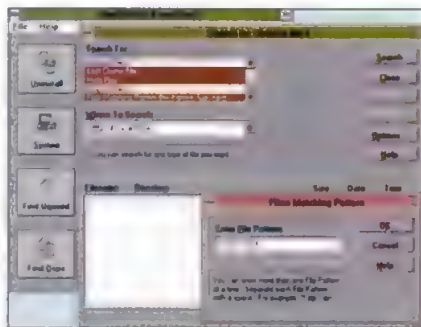
For all its initial promise, however, CleanSweep falls slightly short of the mark in actual use. Our evaluation showed that the most notable shortcoming is the

program's inexplicably slow speed. Even simple deletion of files in an unwanted program's directory—with backup and deletion-confirmation features

turned off—takes an agonizing 7 seconds per file.

Worse, you can't circumvent this weakness by scheduling unattended deletions because confirmation dialog boxes pop up throughout the routine. For instance, we set the program to skip deletion confirmation and back up all material purged. We still had to confirm each action during execution.

Despite charms of its own, CleanSweep falls short of competitors in terms of certain features. For example, unlike Vertisoft's



CLEAN HOUSE: CleanSweep removes the cobwebs left by unwanted programs, program groups, predefined categories of files, or user-specified criteria.

■ Windows Utilities

More PC Tools Broadens Your Windows Survival Kit

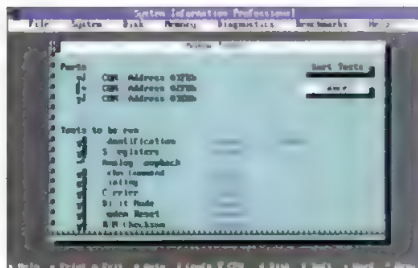
BY BARRY BRENESAL

From Symantec, present home of Central Point Software's PC Tools, comes More PC Tools, a standalone package containing three new DOS and two upgraded DOS/Windows utilities. All told, these additions make a good package even better and should be considered for augmenting your Windows toolkit.

The most important new utility is DriveSpeed, which can have the effect of putting a turbocharger on your hard disk drive. By intercepting and storing a hard disk's read and write requests, it acts as the equivalent of a caching controller. Unfortunately, it can't be configured for individual drive support, so if you've chained a second external drive on a SCSI interface, expect problems from DriveSpeed.

DriveCheck is a tiny (1K) TSR that periodically checks

your hard disk for severe file fragmentation, lost clusters, or cross-linked files. If any of these conditions exist, DriveCheck immediately warns you of that fact. It's much faster than Norton Disk Doctor, but it makes no repairs and won't work inside Windows. BackTrack saves and restores old ver-



CHECK IT OUT: More PC Tools can examine and troubleshoot more hardware, including modem and CD-ROM devices.

sion information of your DOS boot-up and Windows initialization files.

There are also a pair of PC

Remove-IT, CleanSweep can't select a backup directory or drive, or view fonts before deletion. And unlike Neocom Specialists' wInformant, it does not ferret out OLE-associated files. In use, CleanSweep missed obvious files (such as .PIFs) in the Windows directory for applications that were on the chopping block.

Unfortunately, in spite of some thoughtful features and a well-designed interface, CleanSweep must address some limitations in its functionality before fulfilling its potential.

► **CleanSweep for Windows.** List price: \$59.95. Requires: 2MB hard disk space, 4MB RAM, Microsoft Windows 3.1 or later. Quarterdeck Office Systems, Santa Monica, CA; 800-354-3222, 310-392-9851; fax, 310-314-4217.

Circle 402 on reader service card

Tools utilities that have been improved. CrashGuard Pro (formerly CPR) has added an automatic save feature that captures snapshots of unsaved data residing in system memory to facilitate recovery after a total system crash. System Information Pro adds more hardware diagnostics, including the ability to interrogate and to test modems and CD-ROMs. It also uses Intel's Plug-and-Play (PnP) database for easier system configuration, even on non-PnP systems.

Given Central Point's recent merger with Symantec, which sells the competing Norton Utilities, it's entirely possible that all products of the PC Tools and Norton Utilities families may be combined into an all-encompassing product in the near future.

► **More PC Tools for DOS and Windows.** Estimated street price: \$55. Requires: 640K RAM, 6MB hard disk space, DOS 3.1 or later. Peter Norton Group, Symantec Corp., Beaverton OR; 800-445-4208, 503-690-8090; fax, 503-614-7993.

Circle 401 on reader service card

Personal Finance

Panasonic's Personal Check Printer

BY DAVID HASKIN

Panasonic's Check Printing Accountant KX-RC90 (CPA) is a handy pocket-size electronic checkbook, address book, and calculator. The \$279.95 CPA is easy to use and can exchange information with Intuit's Quicken financial management software. Still, it is no substitute for a full-featured information manager, and at times proved a bit awkward to use.

The greatest strength of the CPA system is its size: It weighs less than a pound (including its built-in nickel cadmium battery), and is roughly the length and width of a checkbook (though twice as thick). The unit's 64K of memory stores information about 500 checking account transactions and 200 credit card entries—as well as 50 telephone numbers. If that isn't enough capacity for you, a larger sibling, the KX-RC100, has twice the memory and costs \$100 more.

Information about a check—including its amount, the name of the person it was made out to, and the transaction's category—are entered via a small built-in QWERTY keyboard and displayed on a 2-line by 23-character LCD screen. Not surprising for a device this small, even proficient typists will find themselves reduced to two-fingered data entry, and most users can expect to squint somewhat while reading the display.

The CPA comes with 50 built-in checking account categories that cover a lot of territory. Unfortunately, you can't create your own categories to match those of your business or existing accounting software.

After registering a transaction, just insert a standard personal-size blank check in the slot in the bottom of the unit. The CPA will produce a completed check using its four-pin printer.

The unit does much more

than cut checks, however. It has a built-in telephone directory that is easy to use and can perform basic searches (the CPA can perform simple searches but can't search using wildcard characters or Boolean operators).

The CPA connects to your PC via a \$99.95 serial interface kit, which includes CPA Link software for DOS (a Macintosh interface is also available). The unit can send or receive data in its own format or in the Quicken Import File (QIF) format.

The product's major shortcomings are its rather spare but functional user interface and—especially for a system whose greatest virtue is portability—the size of its serial interface box, which at 6.75 by 4.6 by 1.25 inches is surprisingly large (though

very lightweight).

Battery management was good: The CPA automatically shuts down after 5 minutes of inactivity and includes a lithium backup battery so that you don't lose any data when the nickel cadmium battery runs low. We found that we could register and print about 30 checks before the battery needed charging. However, the data transfer operation requires a lot of power, so we ended up using the Check Printing Accountant's included AC adapter during transfers.

Gadget lovers—and those who write a lot of checks—are



POCKET CHECK: Panasonic's Check Printing Accountant is a check printer with a rudimentary built-in organizer.

likely to fall for Panasonic's Check Printing Accountant, while others will see it more as the answer to a question nobody has asked.

► **Check Printing Accountant KX-RC90.** List price: \$279.95; serial interface kit, \$99.95. Matsushita Consumer Electronics Co., Secaucus, NJ; 800-272-7033, 201-348-9090.

Circle 405 on reader service card

Contact Managers

Day-to-Day Contacts Proves Smaller Can Be Better

BY KEVIN REICHARD

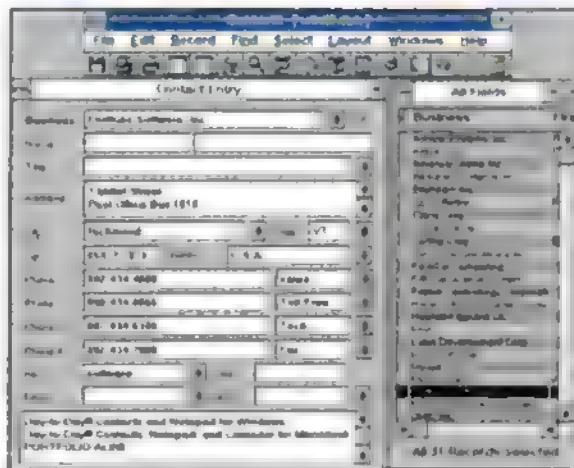
Small is beautiful—or so goes the thinking behind Day-to-Day Contacts 3.0, the \$49.95 contact manager from Portfolio Software. Designed to use as little system memory as possible, Day-to-Day is perfect for traveling business people who want to organize their contacts without overburdening their notebook.

Despite its minimalist approach, Day-to-Day has a surprising amount of power. The system's database can be easily added to or manipulated. Full information for each entry can be exported directly into several popular word processors, including

Ami Pro for Windows, Version 3.0; Microsoft Word for Windows, Version 6.0; or WordPerfect 6.0 for Windows. Records can also be printed out

as labels (in any of 26 supported styles), envelopes, or Rolodex cards, or as an address book.

If you're having trouble locating that name or company you're after, we found that Day-to-



MAKE CONTACT: Day-to-Day Contacts provides the basics in contact management without overwhelming your laptop.

Day's Assist feature was an easy and thorough way to search the program's database. Just enter the desired text string, and Assist searches for matching records.

The Assist feature also helps those of us who weren't spelling-bee champs. To begin a search, you don't need to know the string's exact spelling; by selecting the "Sounds like..." option, you can enter the desired item phonetically. We entered *Adoby* in place of *Adobe*, and Day-to-Day's Assist feature found all records that contained *Adobe*. Once you've located the record, you can export it to a word processor, or have Assist dial the telephone number for you.

If your contact-management needs are elaborate, you'll probably be happier with a more full-featured package. But if all you want is to keep track of addresses and contacts without overwhelming your laptop, then Day-to-Day Contacts is worth a look.

► **Day-to-Day Contacts, Version 3.0.** List price: \$49.95; upgrade, \$29.95. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 3.1 or later. Portfolio Software Inc., Richmond, VT; 800-329-8632, 802-434-6400; fax, 802-434-7000.

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**Does the P5-100XL
cause a family feud?**

**Will the P5-75
Family PC come
between Julia
and Trevor?**

*As the
Hard Drive
Turns*

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**Will Simone try
to make the
4DX2-66
vanish with
wrinkle cream?**



**Furs pictured are made from artificial materials.*

Setting: Lawyer's Office

Characters:

Jonathan Mattison: Lawyer
Kiki: Young widow of the deceased
Anna: Evil daughter of the deceased
Richard: Anna's wimpy husband
Victor: The deceased

**Featured Gateway 2000 PC:
P5-100XL with 1GB hard
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and 17" Vivitron color
monitor.**

We now resume our story already in progress. Victor's family has gathered for the reading of his will. While vacationing on the island of Maltase with his lovely bride Kiki, Victor slipped on the rocks and plummeted over a cliff. His body never found, Anna, Victor's power-hungry daughter, greedily bribed Mattison to read the will.

Anna: Could we get on with it? I have a 1 o'clock appointment with my plastic surgeon and I don't intend to be late.

Mr. Mattison reads the will: "I, Victor Robinson, being of sound mind and body, do hereby bequeath my Gateway 2000® P5-100XL to a woman who is very close to me. This PC's super-powered Pentium™ processor, 16MB of RAM, quad-speed CD-ROM and whopping 1GB hard drive have served me well. I successfully kept two sets of books for the sawmill with this powerful PC. With Microsoft® PowerPoint® presentation graphics program, just one of the applications in Microsoft Office Professional, and the 17-inch Vivitron™ color monitor, I created amazing slide show presentations and lured many investors into my business schemes. Because the P5-100XL is my most prized possession, it's my request that it be given to my young and spirited wife Kiki. I know she loves to dance to the heart-pounding stereo sound from the ACS-31 speakers. Kiki, at \$4,299 the P5-100XL from Gateway 2000 is the best value in the PC industry. Please treat it well."

Anna: What?! I was supposed to get that system. Not that child! I've had my eyes on that P5-100XL since the day Daddy ordered it from Gateway 2000. It's Intel® 100MHz Pentium™ processor is the fastest processor available today that can still run the most popular software applications. It should be mine, not that little gold digger's! Richard! Don't be a spineless jellyfish! Make them give me the PC!

Mattison: Oh, wait Anna, here's something for you. "To my dear Anna, I leave my Yorkshire terrier, Fifi. Remember, it's a dog's life."

Anna: AAAUUUGGGHHHH!

Fifi: Ruff.

Join us next month for "As The Hard Drive Turns." Will Anna seek revenge against Kiki? Will Anna and Fifi be compatible?



pentium
PROCESSOR



GATEWAY2000

"You've got a friend in the business."

8 0 0 - 8 4 6 - 2 0 6 3

Setting: Collapsed Office Building

Characters:

Julia: Successful Realtor

Trevor: Sexy construction worker

**Featured
Gateway 2000 PC:
The P5-75 Family PC multimedia system
with 16-bit sound card and Altec
speakers, TelePath II 14.4K fax/
modem and six exciting Microsoft
software applications.**

Trevor met Julia every afternoon in her office. Since she's married to the contractor who oversees Trevor's construction crew, it's the only way they can continue their torrid affair. But now they are trapped in her collapsed office after Mt. Eruptus exploded into a volcano causing an earthquake measuring 7.1 on the Richter scale.

Julia: Oh, Trevor, what are we going to do. I can't die! I just spent thousands of dollars on fertility treatments so we can conceive our love child after my fortieth birthday party tonight!

Trevor: Let me get this tourniquet on my severely broken arm and then I will use my brute strength to save us.

Julia: Trevor, look! There's my Gateway 2000® P5-75 Family PC™ multimedia system underneath the rubble.

Trevor: Wow! I may look like your average, sexy, suntanned, hunk construction worker, but I love PCs. You know this P5-75 Family PC multimedia system is a lot like me. It has a powerful Pentium™ processor, a massive 730MB hard drive and a 15-inch Vivitron™ monitor for stunning color images. This P5-75 will give us all the PC power we'll need for years to come. And at only \$2,499, it's a great value.

Julia: Yes, and the brawn and raw vigor of this PC also reminds me of you. I can run tons of applications simultaneously. The double-speed CD-ROM, 16-bit sound card and Altec speakers give me amazing multimedia capabilities. And with the fax/modem I can order sexy little numbers from Elizabeth's Enigma for our trysts.

Trevor: That's it! We'll call the Emergency Headquarters with the modem and let them know we're here.

Julia: Oh Trevor! Do we have to? That plaster in your hair is lighting my flames of passion.

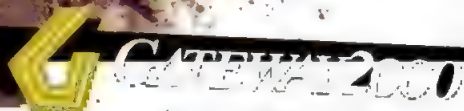
Trevor: We'll have plenty of time for love while we wait for the emergency crew. Look at this cool software. I'll use Microsoft® Works to write a letter to Mom and then I'll hit the links with MS Golf.

Julia: Trevor! What about me? This is our window of opportunity for conception!

Trevor: Just a second dear. Look at this ...

What was Julia going to do? She couldn't lose Trevor to a PC! How humiliating! Sure it's younger and faster, but does it love Trevor like she does?"

*Join us next month for "As The Hard Drive Turns." Will Julia and Trevor conceive before they're rescued?
Will Trevor leave Julia for his new love — Bob?*







All soap opera stars portrayed by Gateway 2000 employees.

Featured Gateway 2000 PC:
4DX2-66 Family PC multimedia
system with a double-speed CD-ROM,
16-bit sound card and Altec
speakers, MS Works, Encarta '95,
Money, Cinematica,
Golf and Fine Artist.

Setting: A fancy living room in a
stately home.

Characters:

Dirk: A debonair businessman

Simone: An emotionally distraught woman

Simone: Oh Dirk, I can't stand it! Our 4DX2-66 Family PC™ multimedia system from Gateway 2000® is taking over our home. It organizes the family schedule down to Jimmy's flights to Paris to see his real mother, and Sally loses all sense of time when she uses Microsoft® Fine Artist. Why only last week she was six and now she's sixteen. The family has no need for me!

Dirk: That's not true Simone. Didn't I profess my love for you by purchasing another city block of Gateville even though you're carrying my brother Rock's baby? Don't I stand by you through your bouts of schizophrenia when you think you are your sister Cheryl? The 4DX2-66 Family PC multimedia system is a productivity tool. We can use MS Money to track your pregnancy expenses so Rock will have an itemized bill, and the children can use MS Encarta™ for their homework. And most importantly we can track your daily medication with the spreadsheet and database in MS Works. Remember last year when you got your prescriptions confused. We don't want you handing out May baskets to the neighbors in nothing but your birthday suit again, now do we? Remember, this family's reputation is at stake here.

Simone: Oh Dirk, you're so good to me. I should've known you're only concerned with my well-being. The 4DX2-66 Family PC multimedia system has everything we need for multimedia including PCI graphics, double-speed CD-ROM drive, 16-bit sound card and Altec speakers. And at \$1,899, we have plenty of money left for that experimental wrinkle cream I want to try!

Dirk: Yes, Simone, Gateway's 4DX2-66 is a wonderful addition to our family. We get a 30-day money-back guarantee and a three-year warranty on parts for our desktop PC and Gateway monitor. Gateway's friendly employees will provide us with technical support for the life of our PC. On-site service is available during the first year in most U.S. locations and may be provided without charge if their technicians determine it's necessary. They'll even send us a free written copy of their warranty if we request it.

Simone: Marvelous! Catch me Dirk. I love this Gateway PC so much I'm feeling faint!

Join us next month for "As The Hard Drive Turns." Will Simone hit her head on the coffee table and start to think that the Gateway 4DX2-66 is her long lost brother Charlie?



8 0 0 - 8 4 6 3 0 6

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4DX2-66 FAMILY PC

- Intel® 66MHz 486DX2 CPU*
- 8MB RAM
- 730MB 10ms IDE Hard Drive
- Local Bus Graphics with 1MB
- Double-Speed CD-ROM
- Sound Card & Altec Speakers
- TelePath™ II 14.4K Fax/Modem
- 3.5" Diskette Drive
- 14" Color CrystalScan® Monitor
- Mini Desktop Case
- 101-Key Keyboard & Mouse
- MS-DOS® 6.22 & WFW 3.11
- MS Works, Encarta™ '95, Money, Cinemania® '95, Fine Artist & Golf
- 3-Year Limited Parts Warranty

\$1899

P5-60 FAMILY PC

- Intel 60MHz Pentium™ Processor*
- 8MB RAM, 256KB Cache
- 540MB 11ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 1MB
- Double-Speed CD-ROM
- 16-Bit Sound Card & Altec Speakers
- TelePath II 14.4K Fax/Modem
- 3.5" Diskette Drive
- 14" Color CrystalScan Monitor
- Desktop Case
- AnyKey® Keyboard & Mouse
- MS-DOS 6.22 & WFW 3.11
- MS Works, Encarta '95, Money, Cinemania '95, Fine Artist & Golf
- 3-Year Limited Parts Warranty

\$2099

P5-75 FAMILY PC

- Intel 75MHz Pentium Processor*
- 8MB RAM, 256KB Cache
- 730MB 10ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 1MB
- Double-Speed CD-ROM
- 16-Bit Sound Card & Altec Speakers
- TelePath II 14.4K Fax/Modem
- 3.5" Diskette Drive
- 15" Vivitron™ Color Monitor
- Desktop Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.22 & WFW 3.11
- MS Works, Encarta '95, Money, Cinemania '95, Fine Artist & Golf
- 3-Year Limited Parts Warranty

\$2499

P5-90 FAMILY PC

- Intel 90MHz Pentium Processor*
- 8MB RAM, 256KB Cache
- 1GB 10ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 2MB
- Quad-Speed CD-ROM
- 16-Bit Sound Card & Altec Speakers
- TelePath II 14.4K Fax/Modem
- 3.5" Diskette Drive
- 15" Vivitron Color Monitor
- Desktop Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.22 & WFW 3.11
- MS Works, Encarta '95, Money, Cinemania '95, Fine Artist & Golf
- 3-Year Limited Parts Warranty

\$2899

Professional Systems

4DX2-66

- Intel 66MHz 486DX2 CPU*
- 8MB RAM
- 540MB 11ms IDE Hard Drive
- Local Bus Graphics with 1MB
- Double-Speed CD-ROM
- 3.5" Diskette Drive
- 14" Color SVGA Monitor
- Mini Desktop Case
- 101-Key Keyboard & Mouse
- MS-DOS 6.22 & WFW 3.11
- MS Works 3.0 & Money
- 3-Year Limited Parts Warranty

4DX2-66 \$1599

4DX2-50 \$1299

(w/ 340MB Hard Drive & 4MB RAM)

P4D-66

- Intel 66MHz 486DX2 CPU*
- 8MB RAM, 256KB Cache
- 730MB 10ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 1MB
- Double-Speed CD-ROM
- 3.5" Diskette Drive
- 15" Vivitron Color Monitor
- Desktop Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.22 & WFW 3.11
- MS Office Professional,** Bookshelf® & Money
- 3-Year Limited Parts Warranty

\$1899

P5-75

- Intel 75MHz Pentium Processor*
- 8MB RAM, 256KB Cache
- 730MB 10ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 1MB
- Double-Speed CD-ROM
- 3.5" Diskette Drive
- 15" Vivitron Color Monitor
- Desktop Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.22 & WFW 3.11
- MS Office Professional,** Bookshelf & Money
- 3-Year Limited Parts Warranty

\$2299

P5-90

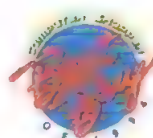
- Intel 90MHz Pentium Processor*
- 8MB RAM, 256KB Cache
- 540MB 11ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 2MB
- Quad-Speed CD-ROM
- 3.5" Diskette Drive
- 15" Vivitron Color Monitor
- Desktop Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.22 & WFW 3.11
- MS Office Professional,** Bookshelf and Money
- 3-Year Limited Parts Warranty

\$2499

P5-100XL

- Intel 100MHz Pentium Processor*
- 16MB RAM, 256KB Cache
- 1GB 10ms IDE Hard Drive
- PCI Enhanced IDE Interface
- ATI Mach 64 with 2MB VRAM
- Quad-Speed CD-ROM
- 16-Bit Wavetable Sound Card & Altec ACS-31 Speakers w/subwoofer
- 3.5" Diskette Drive
- 17" Vivitron Color Monitor
- Tower Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.22 & WFW 3.11
- MS Office Professional,** Bookshelf & Money
- 3-Year Limited Parts Warranty

\$4299



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- Gateway 2000 16-bit CD-quality sound card, compatible with Sound Blaster™ cards, with MIDI/game port, mic in, stereo line in/out
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 - New Altec Lansing ACS-31 three-piece speaker system
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\$99 (to upgrade from systems that include the 16-bit sound card and Altec ACS-5 speakers)

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A Gateway exclusive from Altec Lansing: a three-piece speaker set at a two-piece price. Two 3-inch free-standing speakers crank out up to five watts per channel while the subwoofer can deliver 15 watts of heart-pounding bass.

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■ Color Printers

Kodak XLS 8600: A Color Workhorse for the Office

BY DANIEL GROTTA
& SALLY WIENER GROTTA

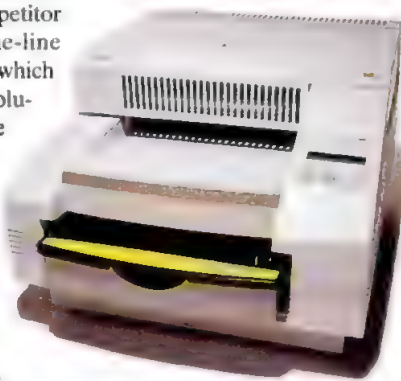
Kodak gives its competition something to worry about with its latest entry in the increasingly crowded dye sublimation printer field. The \$9,995 Kodak XLS 8600 PS produces such superb prints that its only real competitor is Kodak's own top-of-the-line \$20,000 XL 7720 printer—which offers one-third higher resolution and slightly more dynamic range. In addition, the prints from Kodak's new XtraLife ribbons are nearly indistinguishable from photographic enlargements and have a new coating that resists fading.

The XLS 8600 PS—as well as the non-PostScript XLS 8600 version—incorporates an impressive lineup of enhancements and new features. The 300-dot-per-inch printer comes with 32MB RAM (upgradable to 64MB). With additional memory added, we were able to print multiple files in sequence and process larger image files at higher speeds. Together, these enhancements mean higher throughput for this workhorse of a printer. The XLS 8600 PS has a rated monthly duty cycle of 12,000 prints—higher than most other dye sublimation printers, though considerably less than Kodak's XL 7720.

THE NEED FOR SPEED

Most users will immediately notice the XLS 8600's exceptional printing speed: It is up to three times faster than its predecessor, Kodak's XLS 8300. This is due to hardware refinements as well as significant improvements to Kodak's printer drivers, especially the driver for Photoshop Export mode.

Another speed enhancer is the XLS 8600 PS's SCSI-2 port, which, unlike most other printers with a built-in SCSI interface, can be used for transferring print data—and not just as an auxiliary storage option for fonts. For example, we printed a 27.5MB PostScript file in 1



SPEED DEMON: Using the XLS 8600's SCSI/export mode, the printer can produce a complex graphic in just 1 minute 15 seconds.

minute 15 seconds via the SCSI/Export mode. The same file took 4 minutes 30 seconds in parallel/export mode, and 24 minutes in parallel mode using Kodak's Windows PostScript driver. Because the XLS 8600 PS can crank out multiple prints directly from memory—at a speed of about 1 page per minute—the printer can improve the productivity of a busy service bureau or corporate graphics department.

An important innovation is UltraColor, an advanced color management system compatible with the new ColorSync Consortium standards. UltraColor produced realistic skin tones and other hard-to-render hues.

The printer connects to your PC in several different ways: through built-in parallel, SCSI, and LocalTalk interfaces, or via an optional \$995 network card that supports NetWare, Ether-

Talk, and TCP/IP. During testing, the printer was able to correctly sense which interface was being used, and all ports can be active simultaneously.

Setting up and installing the printer and drivers was painless and trouble-free. The only problem we encountered was having to manually tape the ribbon to the takeup spool—a minor hassle at worst. The XLS 8600 PS doesn't use a ribbon carrier, either, so switching between 8.5- by 11-inch ribbons and 9.5- by 14-inch ribbons is a slight inconvenience.

Our biggest configuration problem occurred when we attached the unit to a 486 PC via the computer's parallel port and to a Macintosh Quadra 950 via the Ethernet module. The printer initially failed to print from the PC, producing one short and cryptic error message after another on full-size paper—at a cost of \$2.60 per page. Rather than see our paper, ribbon, and money wasted, we would have preferred if the error codes were displayed on the printer's front panel or the PC's screen.

NETWORK CONFLICTS

Unable to decipher the printer's error messages, we contacted Kodak's technical support staff, who diagnosed the problem as a conflict between the PC's parallel port and the Lantastic network it was connected to. Once we severed the PC from the network, the printer worked perfectly. We were able to alternate between printing from the PC and the Mac without changing any settings, since the printer determines priority by chronological order, regardless of the port.

Kodak has greatly improved the printer's ribbon.

The dyes in the three-color (CMY) ribbon are able to deliver blacks that are as dark as those produced by a conventional 4-ribbon CMYK color printer. Regardless of image content, the prints created by the XLS 8600 PS were generally brilliant and deeply saturated with sharp and well-defined lines and edges.

Instead of a black ribbon, Kodak has substituted a clear laminate coating, called XtraLife, that protects the print against environmental ravages. Because XtraLife filters out ultraviolet light, Kodak guarantees that the prints produced by the XLS 8600 PS will last as long as conventional color prints—about 10 years. Unfortunately, the XtraLife ribbon is available only for 8.5- by 12-inch output at this time.

The bottom line is that the XLS 8600 PS produces the best pictures we have yet to see from a desktop printer.

► **Kodak XLS 8600 PS Printer.** List price: \$9,995. **XLS 8600 Printer.** List price: \$8,995. Requires: 4MB RAM, 4MB hard disk space, Microsoft Windows 3.1 or later. Eastman Kodak Co., Rochester, NY; 800-235-6325.

Circle 408 on reader service card



SHARP AND RICH: Prints from the XLS 8600 have an excellent combination of sharp lines and rich colors.

■ Color Scanners

Instant Images with SprintScan 35

BY MARINO DELZOTTO

Polaroid's new SprintScan 35 scanner is an amazing little device that creates new imaging possibilities by quickly and faithfully digitizing color or black and white negatives or transparencies at high resolution. Priced at \$2,495, the SprintScan 35's ability to move images from film to your PC will make it a valuable asset to photographers, art designers, and computer-oriented photo enthusiasts.

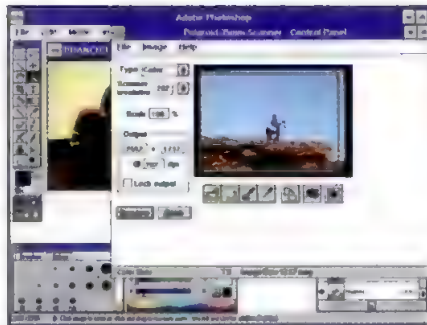
The PC version of SprintScan 35 comes with Adaptec's 1505 SCSI adapter card and EZ-SCSI Lite software, as well as an excellent manual that covers both hardware installation and the use of Polaroid's proprietary software. Overall, installation was quick and easy.

In testing, the SprintScan 35 lived up to its name, performing a high-quality 2,700-dot-per-inch scan of a color slide in about 30 seconds. With a dynamic range of 3.0, the SprintScan can accurately reproduce a broad range of colors, including flesh tones. The system includes a

hardware-based image-enhancement scheme that simultaneously sharpens an image and corrects for color balance problems. The result: The scanned image was always a good representation of the original.

In fact, at times, the images that the SprintScan 35 produced were so accurate that minor scratches and dust particles present on the original film were picked up. The unit's proprietary software was unable to correct any of these minor imperfections, although they could easily be taken care of in PhotoShop or some other image-editing program.

The SprintScan 35



INSTA-SCAN: Polaroid's SprintScan 35 can digitize color negatives and slides in about half a minute.

produces higher resolution scans than Kodak's 2,000-dot-per-inch Rapid Film Scanner—yet the SprintScan costs only one third as much. On the other hand, the SprintScan's features are decidedly no-frills: Color correction, for example, is not adjustable. All scan data (including previews) is 10 bits per color, so while the actual scan is quick, it can take a lot of time to view an image.

All told, the SprintScan 35 unit breaks new ground in terms of price, quality, and speed, and is as close to picture perfect as we've seen to date in slide scanners. Combined with a high-quality color printer, it can be the basis for an electronic dark-room.

► **SprintScan 35.** List price: \$2,495. Requires: *Image editing program that supports Adobe's plug-in standard.* Polaroid Corp., Cambridge, MA; 800-816-2611, 617-386-2000.

Circle 406 on reader service card

■ Imaging

PhotoWorks Plus Turns Film into Pixels

BY MELISSA J. PERENSON

Anyone who's ever snapped a picture can relate to the frustration of having a photograph that's overexposed, cockeyed, or prominently featuring some tourist's head. Seattle FilmWorks, a familiar name in the mail-order film business, seeks to eliminate (or at least diminish) such problems by offering its PhotoWorks Plus for Windows photo-imaging software. When coupled with the company's image scanning service (which will transfer your photographs to floppy disk for a reasonable cost), the \$44.95 program is one of the least expensive ways to bring your photographs to the PC.

But take note: PhotoWorks Plus is no Adobe Photoshop. It lacks the finely tuned image controls and plug-in filter technology that make Photoshop an imaging powerhouse. And while

the scanning process that Seattle FilmWorks uses produces good images, it stores them in a proprietary .SFW image format that can only be read by the PhotoWorks Plus software.

The images in PhotoWorks Plus can be viewed in up to 24-bit color depth and 640-by-480 resolution. High-quality scanners, such as the Polaroid SprintScan 35 (see review above), can capture a more detailed, crisper image, but PhotoWorks Plus' has its own appeal: It's uncomplicated and inexpensive.

The PhotoWorks Plus software features enough user control to let you really have some fun with your pictures. We found it quite easy to correct underexposed or overexposed film by adjusting the hue, saturation, contrast, lightness, gamma, color channels, or brightness.

PhotoWorks Plus can convert your photo to another image resolution, or save it as a .BMP,

.GIF, .PCX, or TIFF for Windows or OS/2, or as a JPEG file. The software also includes a utility that lets you create your own screen saver.

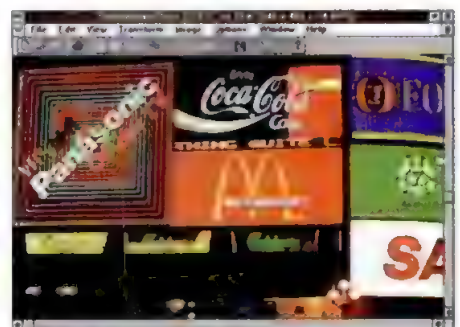
Seattle FilmWorks offers—at reasonable rates—a complete solution to digitizing photographs. It costs \$10.50 to develop a roll of 24-exposure print film and get two sets of 3.5-by-5-inch prints; putting those pictures on a floppy disk adds \$3.95. Transferring 24 existing prints or slides to disk costs \$9.95, while transferring images from negatives costs \$11.95.

PhotoWorks Plus provides enough control and flexibility to satisfy the average user who wants to administer some first-aid to a favorite photo, while Seattle

FilmWorks' Pictures on Disk service is a reasonable alternative to expensive scanners and Kodak's PhotoCD. Overall, this is both a viable and affordable option for amateur photographers and small businesses with modest photo-imaging needs.

► **PhotoWorks Plus for Windows.** List Price: \$44.95. Requires: 4MB RAM, 8MB hard disk space, Microsoft Windows 3.1 or later. Seattle FilmWorks Inc., Seattle, WA; 800-445-3348, 206-281-1390; fax, 206-284-5357.

Circle 407 on reader service card



QUICK FIX: PhotoWorks allows the photo aficionado enough control and flexibility to make corrections to pictures.

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Business CD-ROMs

Your Mutual Fund Selector: Introduction to Investing

BY BARRY BRENESAL

Not all would-be investors are created equal. Some seem to be born with an intuitive understanding of technical analysis tools like Moving Averages and Relative Strength Indicators. Others, however well educated, wouldn't recognize a trend if it bit them on the Fibonacci arc. Your Mutual Fund Selector (YMFS), a \$45 CD-ROM sold by Intuit, provides useful information for the novice investor, presented along a learning curve that's a gentle incline.

YMFS is formatted as a hypertext book, with chapters devoted to explaining the fundamentals about mutual funds and various investment strategies. You can double-click on unfamiliar terms to bring up helpful definitions, and can take notes, place bookmarks, and print individual pages. The contents are sensibly organized and the writing avoids condescension.

At its most basic level, YMFS takes data about your age, taxes, available income, and anticipated expenses (such as college tuition), adds other elements derived from a multimedia risk test (which measures your willingness to take a chance), and presents you with an investment scenario suited to your financial needs.

Drawing on an on-line database of 1,000 mutual funds supplied by Morningstar, an independent fund-rating service, YMFS has great depth. You can examine a variety of statistical factors including beta, standard deviation, and expense and turnover ratios. A paragraph-long synopsis explains each fund's investment strategy, and quarterly updates are available.

The entire Morningstar database is a tremendous resource that can be searched based on variables like minimum allowable

investment, funding philosophy, and percentage of return on 1-, 3-, and 5-year investments. When you find a fund that looks interesting, you can instantly jump to a screen that charts its performance over the past 10 years.

But that's about as advanced as the package gets. Unfortunately, Morningstar's data screens are also where YMFS unaccountably abandons its hypertext links. The only way to get adequate definitions of the program's advanced terms is by

setting a pair of bookmarks in the database and the glossary—but not all terms are listed in the glossary (*R-Squared* is one that is left out). In any case, a bookmark only takes you to the glossary page you initially mark.

That aside, Your Mutual Fund Selector is an excellent tool for the aspiring investor.

► Your Mutual Fund Selector. List price: \$45; database updates, \$13.95 per update or \$39.95 for 4 quarterly updates. Requires:



SCRUTINIZE: Your Mutual Fund Selector allows personalized searches of the Morningstar mutual fund database.

4MB RAM, CD-ROM drive, Microsoft Windows 3.1 or later. Intuit, Menlo Park, CA; 800-624-6930, 415-858-6088.

Circle 410 on reader service card

Audio

Sound Forge 3.0: Sound Without Fury

BY WINN ROSCH

With Sound Forge 3.0, from Sonic Foundry, editing the sound portion of multimedia files is as easy as manipulating images. The \$495 program gives

MIDI files into Windows waveform (.WAV) files. You can also capture sounds through your sound board or grab samples from external synthesizers. In addition, Sound Forge includes all the expected audio control



SOUND INTERFACE: Sound Forge's interface has the look and feel of professional audio equipment.

you full command of any PC audio input and the electronic equivalent of a rack of digital audio processing gear.

Any sound in digital form is raw material for Sound Forge. The program reads and writes nearly any audio file format, converts one format to another, changes sampling rates and bit depths, and even synthesizes

features, including chorus, compress, double, echo, filter, limit, stretch, and an assortment of other effects.

Sound Forge supports Microsoft's Audio Compression Manager (ACM) and the main screen gives you an oscilloscope-like analog waveform display of sound files.

Digital effects controls take the form of sliders, while MIDI manipulation is accomplished via an on-screen keyboard.

Sound Forge, in fact, embraces MIDI, and allows you to patch together MIDI applications through software using a clever MIDI router. This feature is well suited for synchronizing digital audio, MIDI files, and video.

A major limitation to Sound Forge is that it shuffles everything through your PC's hard disk, so the drive's capacity and speed can be a bottleneck. For safety's sake, the program backs up every sound file before editing so you won't lose any originals.

Sound Forge handles audio effects one at a time and processing time varies with complexity. On a 33-MHz 486 PC, it took several minutes to make a pitch change while maintaining the 10 second sound clip's tempo. Although Sound Forge will work with sound systems as primitive as Microsoft's speaker driver, you really need a professional-quality sound board to take advantage of the program's power and fidelity, as it samples at rates up to 60 KHz—better than both CD-ROM and professional-audio quality.

If you need to edit audio on a PC, Sound Forge is up to the task.

► Sound Forge, Version 3.0. List price: \$495. Requires: 4MB RAM, 3MB hard disk space, Microsoft Windows 3.1 or later. Sonic Foundry Inc., Madison, WI; 800-577-6642, 608-256-3133; fax, 608-256-7300.

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CIRCLE 056 ON READER SERVICE CARD

■ Desktop Publishing Brochures, Mailers, and Much More

BY MELISSA J. PERENSON

MySoftware's \$99.95 MyAdvancedBrochures, Mailers & More for Windows proves that with a little determination, you can get it right on the second try. Where MyBrochures and Mailers was a severely limited brochure publishing package, its successor will appeal to both small businesses and home users.

Packed with new features and options, this is no longer a niche product intended solely

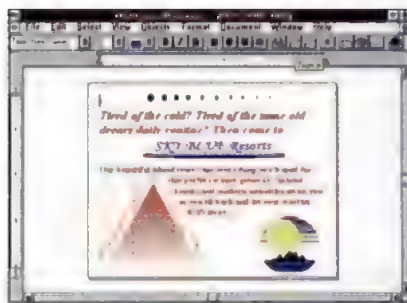
for making three-panel brochures. You can now select from a host of page orientations, including two-fold and four-fold brochures, postcards, and one-page fliers. Unfortunately, there are no templates for preprinted paper to supplement the two-fold and four-fold brochures.

Most of the restrictions on creative design that plagued the original program have been eliminated, so MyAdvancedBrochures will feel right to publishing novices and pros alike.

Yet the program is not as flexible as it could be. There is no way to move objects to the back of a layered design, and while you can rotate text, you can do so only for text inside a box.

Still, MyAdvancedBrochures represents a tremendous advance for MySoftware. In spite of a few missteps, the program allows you to create professional-looking brochures, mailers, postcards, and more with ease.

► **MyAdvancedBrochures, Mailers & More for Windows.** List price: \$99.95. Requires: 4MB RAM (8MB recommend-



ONE-SHEET AD: With MyAdvancedBrochures, you can design attractive, professional-looking postcard flyers.

ed), 8MB hard disk space, Microsoft Windows 3.1 or later. MySoftware Co., Menlo Park, CA; 800-325-3508, 415-473-3600; fax, 415-325-3106.

Circle 413 on reader service card

■ Windows Utilities

Drag And Zip Keeps Track Of Archives

BY J.W. OLSEN

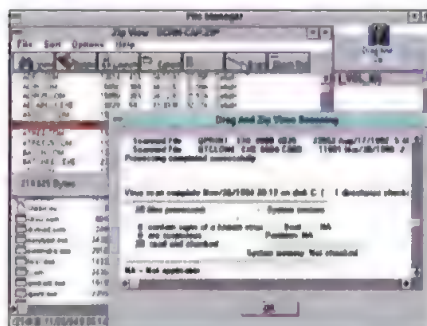
Once your hard disk reaches its capacity, you have two choices: Start working with compressed archives, or get a larger hard disk. Canyon Software's \$30 Drag And Zip, Version 5.0, makes the first alternative easier and cheaper.

Drag And Zip resides in the Windows File Manager. It displays and extracts archive contents, or creates new archives. Antivirus code from Integrity Master has been integrated into Drag And Zip, so you can scan archives with a mouse click. The program also links directly to Internet World-Wide Web browsers (including Mosaic and Netscape). When you download a compressed file, Drag And Zip pops up and displays the file's contents.

Unfortunately, there are a couple of minuses to contend with: Unlike some of its competitors, Drag And Zip supports only .ZIP and .LZH file formats, which can limit its usefulness (the program does, however, support the .GZ single-file compression format that is an emerging Internet standard).

Furthermore, the antivirus code was evidently sewn into Drag And Zip in a hurry, and we discovered conflicts with previously installed resident antivirus software (including Microsoft Vsafe Manager and Central Point Anti-Virus).

Overall, however, Drag And Zip is a great buy and raises the



PRACTICE SAFE ARCHIVING: Drag And Zip's built-in virus scanner is always just a mouse click away.

stakes for archive utilities.

► **Drag And Zip, Version 5.0.** List price: \$30. Requires: 2MB RAM, 1MB hard disk space, Microsoft Windows 3.1 or later. Canyon Software, San Rafael, CA; 800-280-3691, 415-453-9799; fax, 415-453-6195.

Circle 412 on reader service card

■ Windows Utilities

Same<>Same Keeps PC Files in Sync

BY J.W. OLSEN

Synchronizing any combination of home, office, and portable PCs has just gotten a lot easier with Same<>Same 2.2, from DPM Computer Solutions. This \$25 shareware utility shuffles files between machines via floppy disk—no cables are required.

You begin by defining files to transfer, such as \EMAIL*. * and \WRITE*. *. You can include all associated subdirectories with a mouse click and indicate file types to exclude. You can also limit transfers to files updated since your

last transfer session or since a designated date.

To begin a transfer, insert a floppy disk and click the Download button. Uploading to your

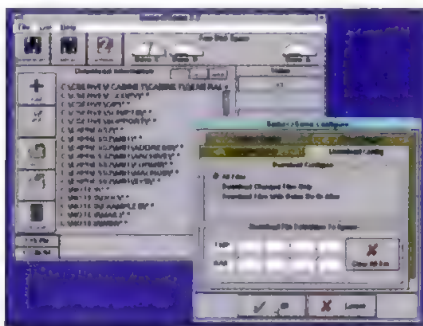
second PC is even easier: Insert the transfer disk and begin.

Same<>Same supports Stacker 4.0 disk compression, which is essential for transferring very large files, as Same<>Same can't split a file across floppy disks.

Its rough edges aside, Same<>Same makes it easy to synchronize computers without using cables.

► **Same<>Same, Version 2.2.** List price: \$25. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 3.1 or later. DPM Computer Solutions, San Diego, CA; 619-693-4162.

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TAB CONVENIENCE: Same<>Same's well-organized options window makes changing preferences easy.

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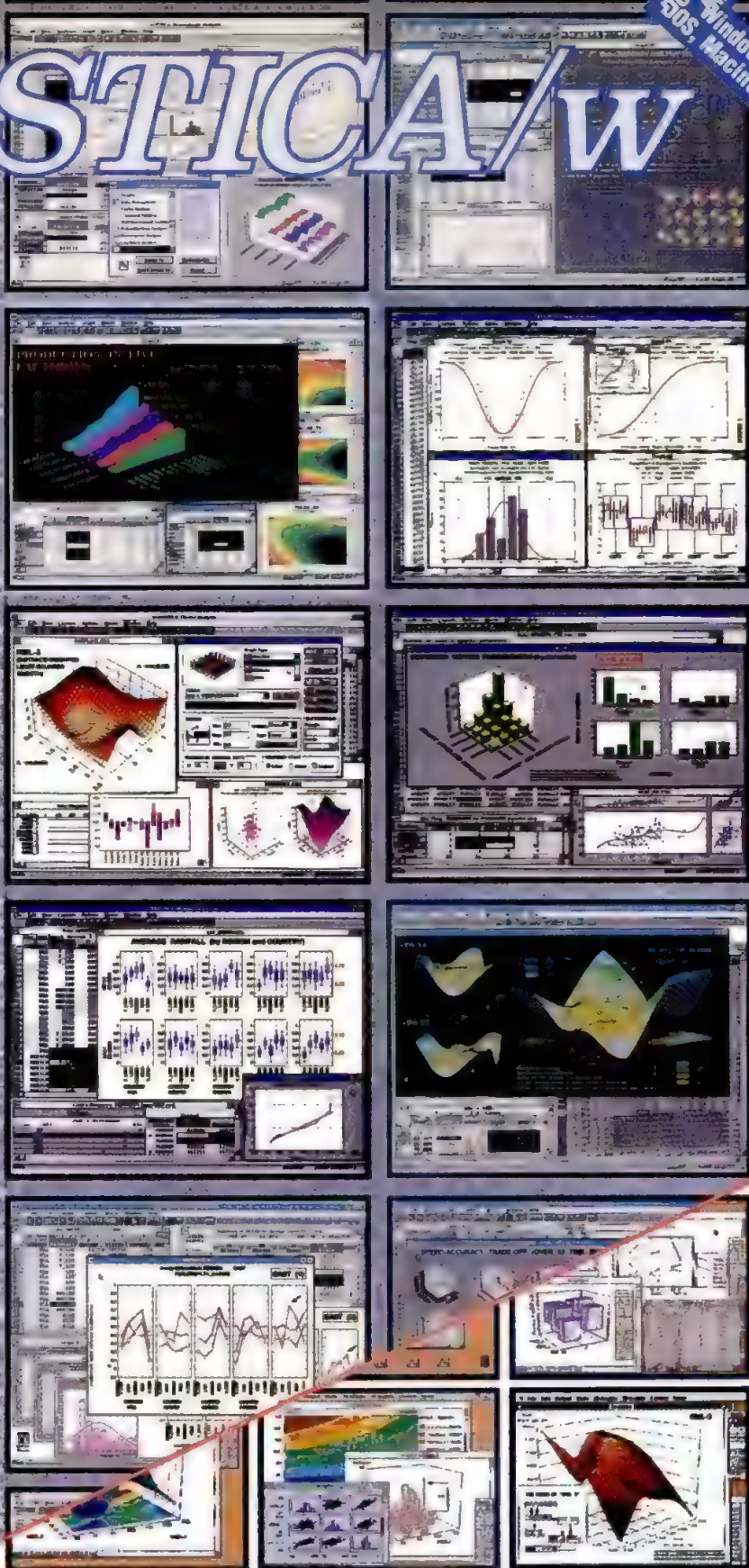


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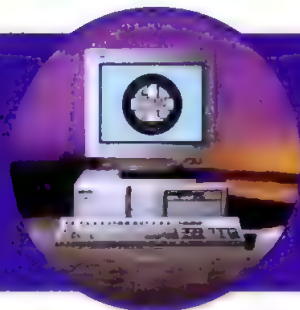
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- Integrated Desktop Management Interface (DMI)³
- EPA Energy Star certified
- Free three-year limited warranty for parts and labor²



¹Source: 1994 J.D. Power and Associates Desktop PC Customer Satisfaction Study.™ Study conducted among business users and based on 1,528 user respondents.
²Feature included with some models. All HP Vectra PCs come with MS-DOS® 6.2 and MS Windows for Workgroups 3.11 pre-installed; HP mouse and keyboard included.
³U.S. list price, dealer prices may vary. Monitor not included. *Other capacities available. †First year on-site, 24-hour service. Second and third year return to dealer.
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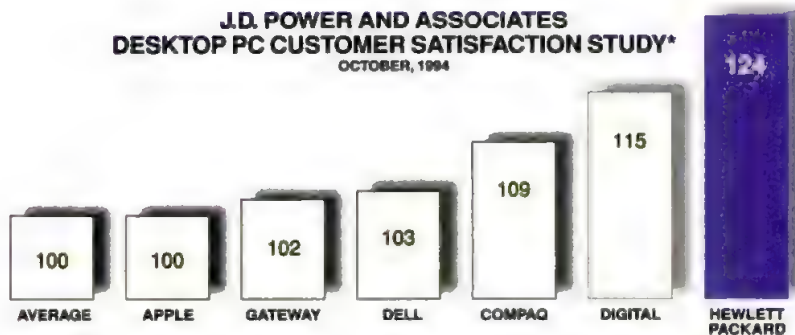
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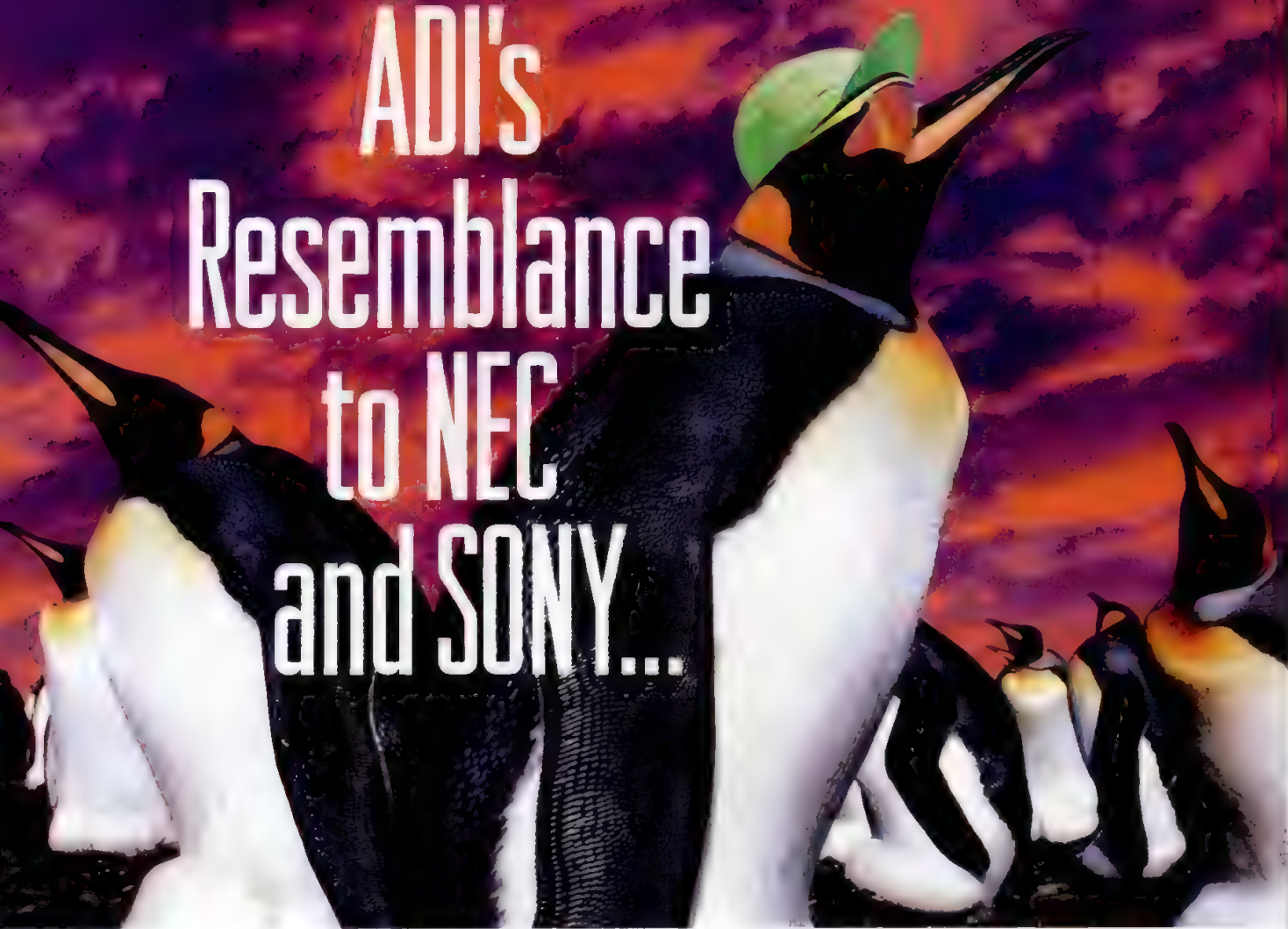
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By Asa Somers

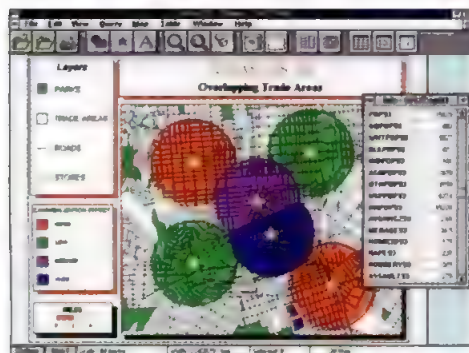
IMPROVED

Mapping Power at the Right Price With Atlas GIS 3.0

MapInfo Corp.'s namesake product has traditionally been the place to look for high-end mapping capabilities. But the new version of **Strategic Mapping's** Atlas GIS for Windows includes a number of the same sophisticated features at the rather accommodating price of \$495.

Atlas GIS 3.0 includes enhanced geocoding capabilities, such as a built-in database of all street addresses in the U.S. The geocoder will add longitude and latitude to files, and you can use third-party address files or public-domain files, such as those available from the U.S. Census Bureau, to geocode your database. You can even type in a specific street address and the software will zoom directly to that spot on the map.

Version 3.0 adds digitizer support, allowing you to trace paper-based maps to create digital versions; and raster support, which gives you the ability to underlay images such as satellite photos with Atlas GIS maps. The package



DIVIDE AND CONQUER: Geocode your maps by ZIP code or street address.

comes with a selection of geographic and demographic information, including ZIP codes, interstate highways, regional populations, and Nielsen advertising regions.

► **Atlas GIS, Version 3.0.** List price: Single-user version, \$495; 3-user license, \$1,195; 10-user license, \$3,495; upgrade from Version 2.0, \$99; upgrade from Version 1.0, \$199. Strategic Mapping Inc., Santa Clara, CA; 800-472-6277, 408-970-9600; fax, 408-970-9999.

Circle 468 on reader service card

Photography by Thom O'Connor

HOT PROSPECT



Liberty Notebooks Pack Heavy-Duty Features in Light Boxes

It's getting easier for notebook manufacturers to build high-end components into lighter, slimmer systems. Witness Gateway's three new Liberty portables, particularly the \$4,799 Best Buy model.

Each unit weighs just 4.2 pounds (including the nickel hydride battery), measures 1.6 by 10 by 8 inches (HWD), and includes a 10.4-inch dual-scan color display. The Best Buy configuration features a DX4/100 CPU, 24MB of RAM, a 720MB removable hard disk, a 14.4-Kbps modem, and 1MB of video memory.

The Liberty units exist between definitions. Without internal floppy disk drives, they don't qualify as true notebooks, but they're a little too heavy to be considered subnotebooks. An external floppy drive comes standard with the Best Buy and as a \$79 option with the other two Liberty configurations. All three models have pointing-stick cursor control, can tilt for added typing comfort, and handle file transfers and printing via built-in infrared transmitter/receivers. Gateway estimates battery life to be in the 3- to 4-hour range.

The \$3,499 DX4/100 Liberty has 8MB of RAM and a 540MB hard disk, while the \$2,799 DX2/50 model comes with 8MB of RAM and a 340MB hard disk.

► **Gateway Liberty.** List price: Best Buy DX4/100 configuration, \$4,799. Gateway 2000, North Sioux City, SD; 800-846-2000, 605-232-2000; fax, 605-232-2023.

Circle 467 on reader service card

NEW

Symantec Makes the Missing Link

Users of **Symantec Corp.**'s contact manager, ACT! for Windows, can now communicate with a central ACT! database when computing on the road. The company has recently announced ACT! Link, an add-on that is scheduled to ship sometime this spring. Clicking on the Synchronize option sends your remote changes back to the central database, where they are incorporated. New updates are automatically sent back to remote users the next time they dial in. ACT! Link accepts the last change of a given day as the final update to a record, taking different time zones into account. The product contains a Literature Rack of critical corporate literature that remote users can browse, the ACT! Mail feature that turns ACT! Link into an e-mail package, and security options that screen unshared files from being viewed, altered, or deleted by other users.

► **ACT! Link.** List price: \$299.99. Symantec Corp., Cupertino, CA; 800-441-7234; 503-334-6054; fax, 503-334-7400.

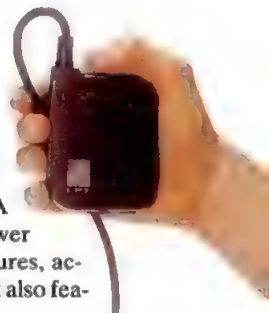
Circle 480 on reader service card

IMPROVED

Frame Grabber That Fits in the Palm of Your Hand

Digital Vision has reengineered its ComputerEyes/LPT video frame-grabbing device with enhancements that target portable users. Like the original unit, the improved ComputerEyes/LPT costs \$399.95, fits in your hand, and easily connects via the parallel port.

ComputerEyes/LPT is a 24-bit color video-capture device that features an image grab speed of 1/30 second. The big advance is that the new version requires no external power supply, as it draws from either the PC or from three AAA batteries that provide power for up to 500 image captures, according to the company. It also fea-



New & Improved

tures a faster preview mode for improved framing and focusing. A new driver allows for direct captures from any Twain-compatible application.

► **ComputerEyes/LPT.** List price: \$399.95. Digital Vision Inc., Dedham, MA; 617-329-5400; fax, 617-329-6286.

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NEW

The Little Schoolhouse Logs On

theLINQ, now available from **Quality Computers**, is a new service designed specifically for schools that provides cus-



Schools can post PTA meeting schedules on-line for parents to check from home.

tomized and filtered access to the Internet. Teachers and students have access to e-mail, on-line forums, and software downloads via theLINQ's point-and-click interface, although superfluous or inappropriate material is weeded out by Quality Computers before it is delivered to the school. On-line material is also rated by the company, so that school administrators can determine an appropriate level of access on the basis of grade level. Even parents and other members of the community can log on via modem in order to view lesson plans, lunch menus, and event schedules.

► **theLINQ.** List price: Initial software and hardware bundle, under \$1,000; on-line service fees, 10 cents per user per month. Quality Computers, St. Clair Shores, MI; 810-774-7200; fax, 810-774-2698.

Circle 475 on reader service card

NEW

CD-ROM Drive Plugs into Your PCMCIA Slot

EXP Memory has recently introduced the double-speed EXP CD-940 CD-ROM drive, which connects to your desktop or portable PC via a standard Type II PCMCIA slot. The unit

BRIEFS

Software

Solomon Software has introduced an incremental upgrade of its Solomon IV modular accounting software. Version 1.5 is designed to improve performance, and is also now available in a single-user version that can be upgraded to peer-to-peer or client/server editions. Each module costs \$495 for the single-user version; a six-user network license costs \$1,295 and a 100-user license costs \$10,995. The new Purchasing module offers multiple purchase-order types and a vendor performance analysis report, and it retains purchasing information for up to 99 periods for historical reporting. 800-879-2767, 419-423-3688.

The WizardWorks Group has announced CompuWorks Office, an entry-level integrated office application package containing a word processor, a spreadsheet, a database, a report writer, and a chart-creation package. The \$59.99 product provides basic, easy-to-use functionality, and it supports OLE, has detailed on-line help, and features a common toolbar for all applications. 612-559-5140; fax, 612-559-5126.

Wall Street Analyst, a new investment-charting software package and on-line service that provides day-to-day analysis of stocks, commodities, and mutual funds, is now available from **Omega Research**. The package will scan your portfolio of securities, pointing out key market movements, and it includes a number of chart types that can track securities on a daily, weekly, or monthly basis. Wall Street Analyst lists for \$69.95, which includes the first month of on-line connection; thereafter, you can expect to pay from \$35 to \$50 dollars per month, depending on your needs. 800-422-8587, 305-270-1095; fax, 305-270-8919

Transparent Language has introduced Version 3.0 of its series of language instruction software packages. Transparent Language 3.0 now contains interactive sound, allowing you to hear authentic stories and articles in spoken Spanish, French, German, Italian, or Latin. You can record your

weights 2.8 pounds, measures 1.75 by 5.75 by 9.25 inches (HWD), and requires no external power supply, as it draws current straight from your computer. The \$449 CD-940 features a maximum data-transfer rate of 320 Kbps and will automatically switch into a power-saving idle mode when it is not being accessed in order to prolong your notebook computer's battery life.

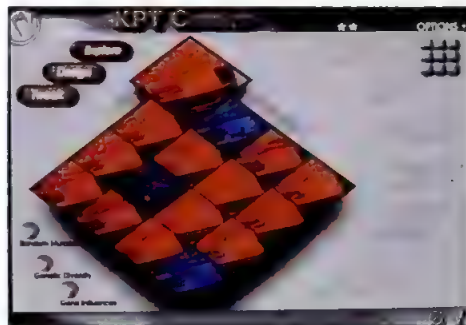
► **EXP CD-940.** List price: \$449. EXP Memory Inc., Irvine, CA; 714-453-1020; fax, 714-453-1319.

Circle 477 on reader service card

NEW

Create Custom Convolution Kernels with KPT Convolver

HSC Software, the maker of Kai's Power Tools, has introduced a new image-processing program called KPT Convolver, which can be used with any image-editing application that supports the Adobe plug-in architecture (such as Photoshop or Fractal Design Painter).



KPT Convolver's Explore mode offers you 16 comparative thumbnails at once.

Convolver takes a new approach to image processing by presenting many controls and filters in a single environment, rather than spreading them out among multiple dialogs.

As a result, you can preview the eventual outcome of a certain series of graphical effects in real time. Convolver has a three-dimensional user interface that offers three work modes: Explore, which lets you randomly try different effects; Design, which gives you more control over the level to which certain effects are applied; and Tweak, which allows you to fine-tune an image. HSC has added a "reward" system to the Convolver, which makes more sophisticated features available to you as you master the program.

► **KPT Convolver.** List price: \$199. HSC Software, Carpinteria, CA; 805-566-6200; fax, 805-566-6385.

Circle 473 on reader service card



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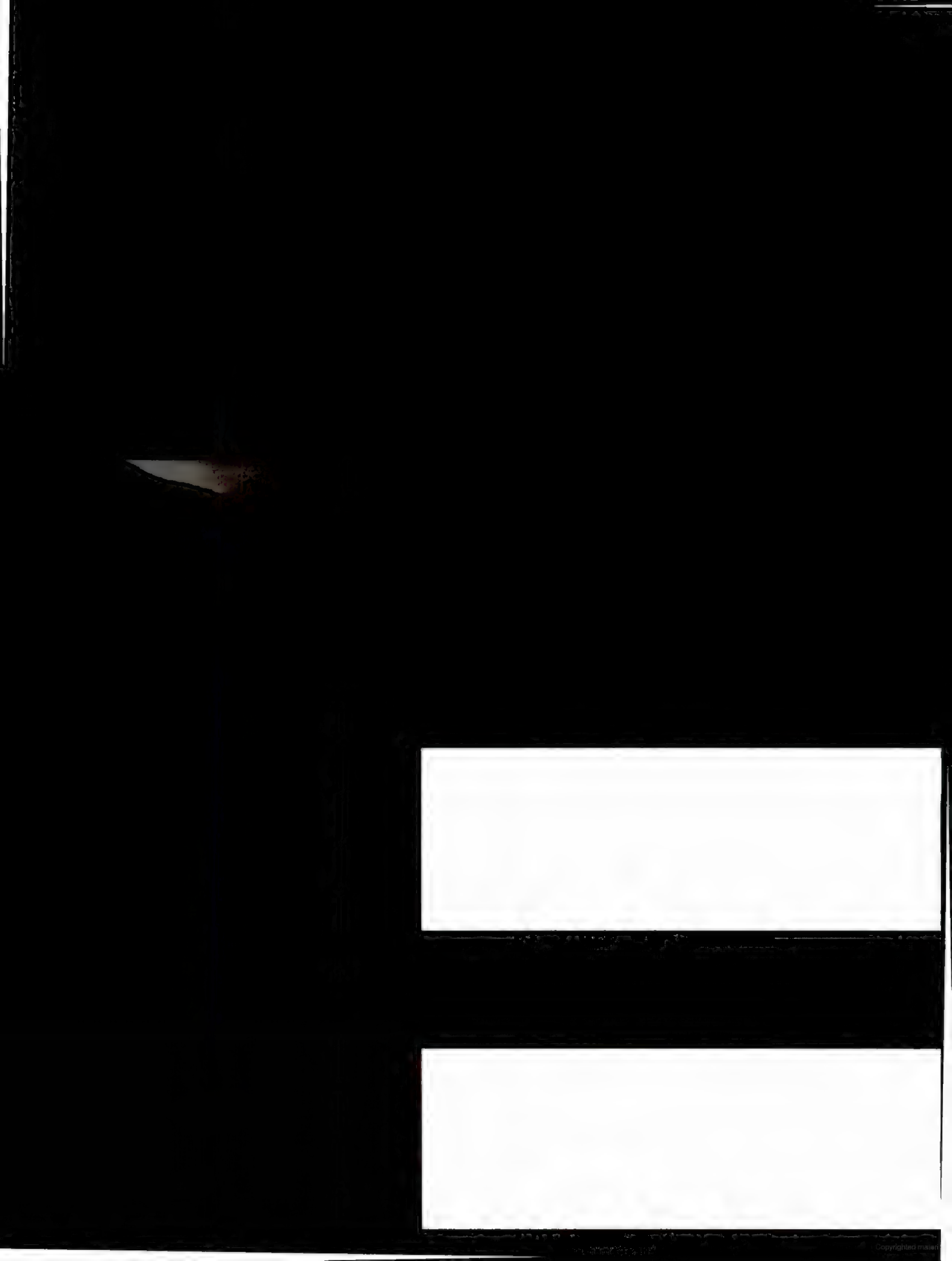
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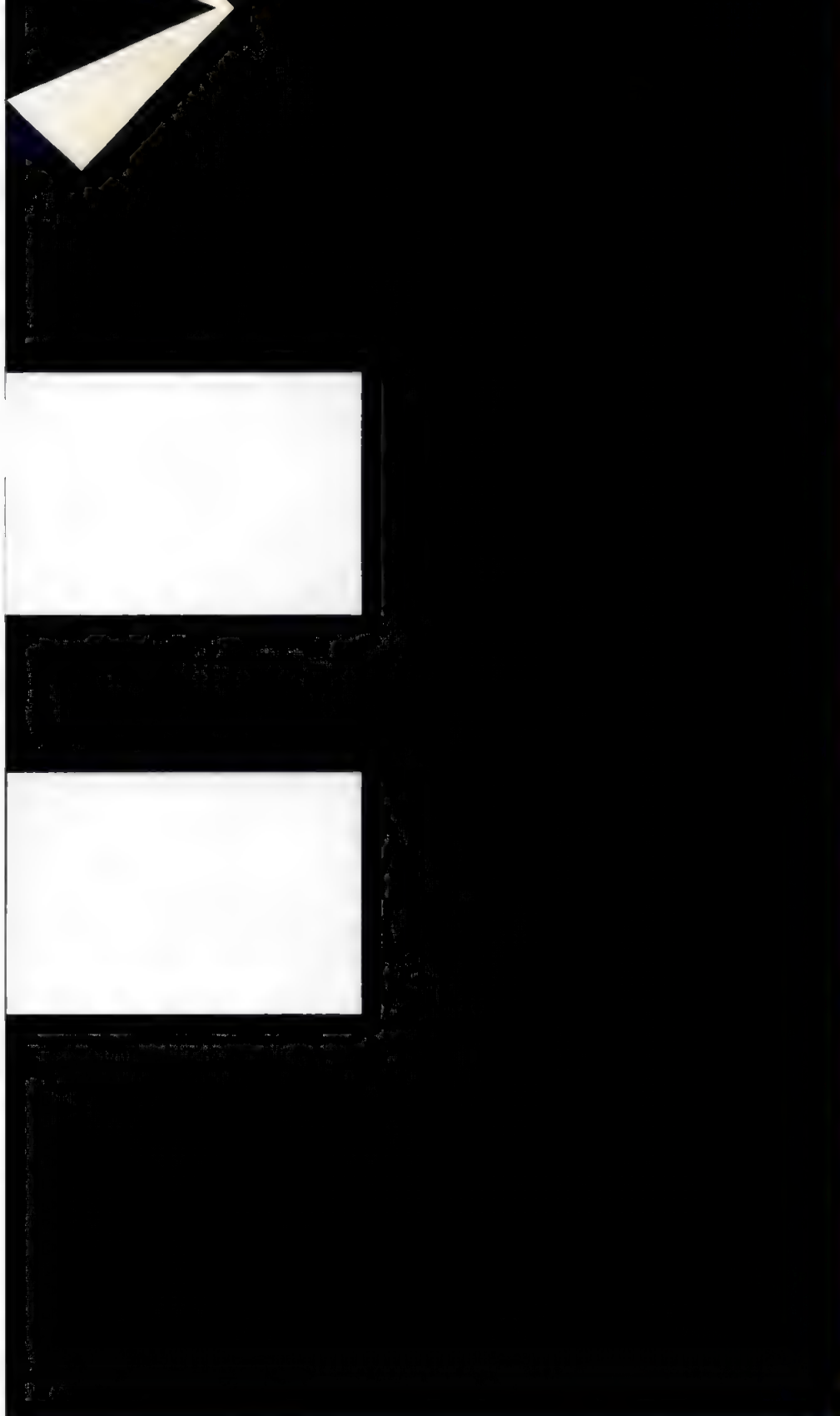
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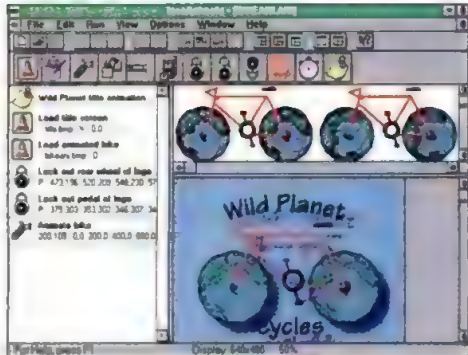
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IMPROVED

IconAuthor's Latest Sequel Supports SQL

AimTech Corp. has recently introduced Version 6.0 of IconAuthor, its multimedia application-creation product. This new release adds cross-platform compatibility, which allows you to create applications and play them on Windows, OS/2, and Unix platforms without a complicated conversion process. (The package



IconAnimate has a new Windows 95-like interface.

also plays your applications on the Macintosh platform.) Version 6.0 features database accessibility via Structured Query Language (SQL), giving you the ability to integrate data from outside applications into your presentation. The \$4,995 product also includes a cross-platform animation editor called IconAnimate, editors for the creation of objects and video, and free internal runtime licenses.

► **IconAuthor, Version 6.0.** List price: \$4,995; upgrade from Version 5.1, \$695. AimTech Corp., Nashua, NH; 603-883-0220; fax, 603-883-5582.

Circle 471 on reader service card

NEW

When Function Equals Forms

JetForm Corp. has announced a business form-creation package called JetForm BizForms, targeting the SOHO market. The product comes with over 100 intelligent forms templates, as well as letterhead, envelope, and pamphlet templates. The intelligent forms can perform calculations, process quotes, and add interest or taxes, as well as insert the current time and date. You can import your company's logo or create one with the included clip-art file.

► **JetForm BizForms.** List price: \$89. JetForm Corp., Jaffrey, NH; 800-367-6375; 603-532-8641; fax, 603-532-8657.

Circle 479 on reader service card

BRIEFS

Software

own voice and play it back simultaneously with the prerecorded audio, and Transparent Language will show you a graphic representation of your pronunciation versus that of the included speaker. The program includes pop-up grammar help; an Alphabet Overview, which provides comprehensive explanations of how specific letters are pronounced in context; and several new interactive language games. The Master Program Package contains three Transparent Language titles in any one language and lists for \$99 (floppy disks and audio cassettes) or \$129 (interactive CD-ROM). 603-465-2230; fax, 603-465-2779.

TeleMagic has introduced a new release of its relational contact manager. TeleMagic, Version 1.5, adds Database Synchronization, which updates information provided by remote users. Also new are an internal e-mail system, Activity Browse and Group Activity Purge commands, and improved word processing links. The product is offered in a \$500 single-user version and a \$1,300 five-user network version. Single-user network licenses are available for \$250 each. 800-835-6244, 214-733-4292; fax, 214-733-4251.

Hardware

For multimedia users on the go, **Toshiba America Information Systems** has introduced the T2450CT high-performance notebook computer. The unit comes with either a 340MB or 520MB hard disk, 8MB of RAM (expandable to 32MB), a 9.5-inch active-matrix color screen, a graphics accelerator, and local-bus video. An optional 16-bit sound card supports MIDI and .WAV files, and an integrated SCSI-2 port lets you connect to an external CD-ROM drive. The T2450CT has a 7-pound travel weight and is expected to sell on the street for \$4,349 to \$4,949, depending on feature set. 800-334-3445.

The \$1,649 Genicom 7612 12-ppm laser printer from **Genicom Corp.** is designed for small workgroups and desktop users. The unit comes standard

IMPROVED

Accounting Software Prices Hit Rock Bottom with Pacioli 2000

M•USA Business Systems first made waves in the accounting world when it introduced its DOS-based accounting package, Pacioli 2000, for only \$49. Version 3.0 lists for \$29.95 and adds a number of enhancements. The new job-costing module keeps track of products' estimated costs, billable amounts, payments received, and time schedules. M•USA has added a redesigned user interface that resembles Windows with pull-down menus and full mouse support. A new pen-and-pencil feature is perfect for "what-if" scenarios, and Version 3.0 includes 23 predefined account charts that can be moved from one group to another.

► **Pacioli 2000, Version 3.0.** List price: \$29.95. M•USA Business Systems Inc., Dallas, TX; 214-386-6100; fax, 214-404-1957.

Circle 470 on reader service card

NEW

Fast and Affordable Thermal Dye Printing

For the highest quality color printing from the desktop, you'll want to investigate thermal dye transfer technology, but be prepared to wait at least 2 minutes per page. **Sony Electronics** has recently introduced the UP-D8800 and UP-5500 printers, which start at \$7,495 and, according to the company, offer extremely quick full-resolution print speeds of about 90 seconds per page. The UP-D8800 can



The Sony UP-D8800 can print at either 150 or 300 dots per inch.

produce images of up to 8.5 by 11 inches and features user-selectable output resolution (150 or 300 dpi). The A5-size UP-5500 has an analog interface for printing from video or other external sources, although a SCSI adapter (priced under \$1,000) for use with a PC is offered as an option. The 5500 has multiple print modes and a maximum rated print speed

Cool Computer Upgrades.

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John Dvorak, *PC Magazine*, March 30, 1993

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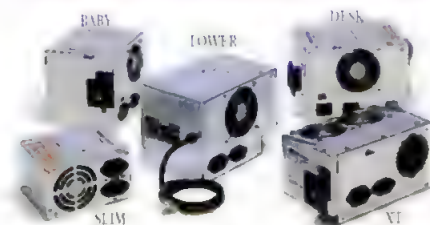
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Ed Bott, *PC Computing*, October 1994



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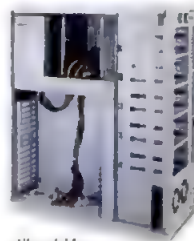
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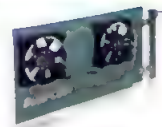
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► **Sony UP-D8800 and UP-5500.** List price: \$7,495 each. Sony Electronics Inc., Business and Professional Products Group, Montvale, NJ; 800-472-7669, 201-930-1000.

Circle 473 on reader service card

NEW

JVC Broadens CD-ROM Recorder Offerings with the XR-W2001

JVC Information Products of America has introduced the XR-W2001 2X double-speed CD-ROM recorder to complement its line of recording hardware and software. The unit comes bundled with either the Personal Archiver, JVC's data-storage program, or Personal ROMMaker, the company's full CD-ROM-production software system;



JVC's XR-W2001 targets midrange CD-ROM-replication needs.

it is positioned between single- and quad-speed CD-ROM recorders to target midrange recording needs. The XR-W2001 measures 5.25 inches in height and comes standard with 1MB of buffer memo-

ry. When purchased with Personal ROMMaker, the unit comes with a 1GB hard disk.

► **JVC XR-W2001 2X.** List price: With *Personal Archiver* software, \$2,595; with *Personal ROMMaker* software and 1GB hard disk, \$6,695. JVC Information Products of America, Irvine, CA; 714-261-1292; fax, 714-261-9690.

Circle 476 on reader service card

NEW

High-End Mitsubishi Monitors Feature DiamondTron CRTs

Mitsubishi Electronics' new, vertically flat DiamondTron monitor tubes have appeared in just a few monitors to date, and now the company itself has rolled out its own monitors based on the visually sharp CRT. The \$1,199 17-inch Diamond Pro 17TX has a 0.25-mm aperture grille pitch and displays noninterlaced resolutions of up to 1,280-by-1,024 at a refresh rate of 75 Hz. The \$2,275 21-inch 21TX

BRIEFS

Hardware

with a 150-sheet multipurpose feeder, a 500-sheet universal paper cassette, PCL 5e and PostScript Level 2 compatibility, and 2MB of memory (expandable to 26MB). The 7612 provides enhanced 600-dpi print resolution and 89 resident font styles. 800-436-4266.

As part of **Ositech Communications'** Trumpcard series of multifunction PCMCIA devices, the new Queen of Diamonds provides a cellular fax and audio capabilities in one Type II card. The unit comes in either 14.4-Kbps or V.34 versions and incorporates either business audio (16-bit stereo recording and playback) or enhanced audio (which adds a 20-voice FM synthesizer and MIDI playback). All configurations incorporate intelligent power-conservation technology, which shuts off power to the modem portion of the card when it is not in use; no external power supply is needed for the card. The Queen of Diamonds lists for \$549 to \$849, depending on configuration. 800-563-2386.

The TowerFeed multitray sheet feeders from **Hilton Systems**, which are designed specifically for use with HP LaserJet printers, come in two desktop configurations—a \$2,395 three-drawer model and a \$2,895 four-drawer model—and three floor-standing configurations—a \$3,895 five-drawer model, a \$4,395 six-drawer model, and a \$4,895 seven-drawer model. Each drawer accommodates up to 500 sheets of legal- or letter-size paper, and included software lets you select any tray or sequence of trays. Your LaserJet sits on top of the feeder. 516-759-7018; fax, 516-759-7028.

And Finally...

America Online has announced plans to offer 14.4-Kbps access to its on-line service at no extra cost to users. . . . **Compaq Computer Corp.** has reduced the price of its LTE Elite series of notebooks by up to 15 percent. . . . **Lotus Development Corp.** has announced a competitive upgrade license to encourage users of other e-mail packages to switch to its cc:Mail LAN System networked mail software. The license provides a 50 percent discount on the estimated retail price.



The Diamond Pro 17TX has a vertically flat DiamondTron CRT.

has a maximum noninterlaced resolution of 1,600-by-1,280 at 75 Hz. Both contain the DiamondTron tube and Mitsubishi's proprietary NX-DBF electron gun, and they come with Diamond Control on-screen monitor-adjustment software and DiamondMatch color-calibration software. They meet both Energy Star and MPR-II power-management and emissions standards.

► **Diamond Pro 17TX.** List price: \$1,199. **Diamond Pro 21TX.** List price: \$2,275. Mitsubishi Electronics, Cypress, CA; 800-843-2515; 714-220-2500; fax, 714-229-3854.

Circle 481 on reader service card

IMPROVED

BusinessObjects 3.1 Adds Query And Analysis Capabilities

Business Objects has introduced Version 3.1 of its BusinessObjects reporting and analysis tool. Building upon the company's Business-Intelligent Querying capabilities—which let you use business terms, not SQL commands or database structures—Version 3.1 continues to target end users with new balloon help, 3-D dialog boxes, and in-place cell editing. The new release adds the Report Assistant tool for developing various reports with point-and-click operations; you can choose from among five predefined report formats. The new Multi-Level Alerters let you visually monitor key events in a report. For example, the package can be instructed to highlight a company's name when its revenues exceed a certain level. An added "off-line mode" allows mobile users to develop reports without being connected to the home database.

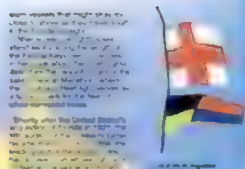
► **BusinessObjects, Version 3.1.** List price: *User Module*, \$595; *Manager Module*, \$3,495. Business Objects Inc., Cupertino, CA; 408-973-9300; fax, 408-973-1057.

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- 16MB RAM
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- **4X CD-ROM** drive and 3.5" 1.44MB floppy drive
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- ZEOS 14" 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch
- MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse

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Pentium-66	\$4095
Pentium-90	\$4245
Pentium-100	\$4645

- 24MB RAM
- High-speed 2GB SCSI hard drive
- PCI local bus SCSI controller
- **4X CD-ROM** drive and 3.5" 1.44MB floppy drive
- **Diamond Stealth 64-bit** PCI local bus SVGA graphics card with 1MB DRAM
- ZEOS 14" 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch
- MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse

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ZEOS Ambra computers are not just another line of systems. They're the incredibly affordable and

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ideal solution to your network needs.

Why ideal? The ZEOS Ambra is loaded with hearty features in a space-saving, case. You get a choice of Intel processors—486DX2-50 or 486DX2-66—that can be upgraded to Intel's Pentium OverDrive Processor; on-board local bus video; and enough bays to add a CD-ROM, 5.25" floppy drive and tape backup. The best news: all this is available at a lean price that will leave a little green in your pocket.

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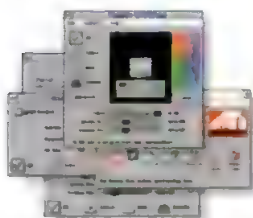
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The squadron of 64-bit graphics accelerators from ATI – the GRAPHICS PRO TURBO, WINTURBO and GRAPHICS XPRESSON – has landed. Affordably priced from only \$179, they're attacking computers with rocket-like performance, laser sharp graphics and galactic true colors.

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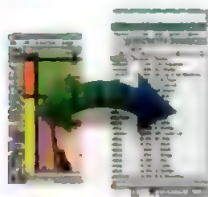
FlexDesk+

For enhanced operation and complete control of Windows options

Winmarks*, will conquer even the most complex applications. Plus, the flicker-free display – at up to 100Hz – reduces eye-strain over prolonged periods of attack.

Propelling Windows

Armed with an arsenal of utilities to enhance Windows, the *mach64* graphics accelerators breeze through Windows applications quickly and effortlessly. The unique WinSwitch feature allows color and resolution to be changed - *without restarting Windows*. A stellar range of software drivers enable popular operating systems to be explored – OS/2, UNIX, Windows NT, CAD, DOS and others.



WinSwitch

Change resolution and color without exiting Windows

Beam up an ATI 64-bit graphics accelerator today. There's one to meet every application, budget and bus type. They're light years ahead of other accelerators.

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*WinBench 4.0 and PC Bench 8.0 performance tests done on a Pentium 90MHz, 16MB RAM, 256K cache, 420 MB HD, using 2MB and 4MB PCI graphics cards. WinBench 4.0 at 1024x768/256 colors (large fonts) and 800x600 in 16.7M colors (small fonts) at 70Hz refresh rate.

**Suggested US retail price, dealers may sell for less.

Invasion of the 64-bit Graphics

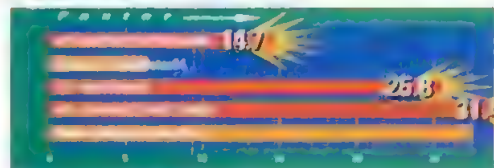
- Fast 64-bit Acceleration
- Affordably Priced from \$179*
- Instant Windows Mode Switching

OTHER FEATURES

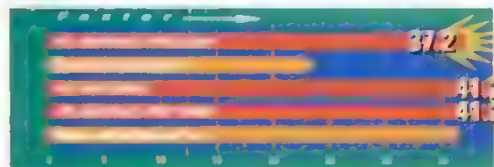
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WINBENCH 4.0 - 16.7 million colors



WINBENCH 4.0 - 256 colors



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- For professional true color graphics
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- Value priced VRAM accelerator (similar to GRAPHICS PRO TURBO)
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Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Tin Albano

Superscaling the PC Mountain

BY NICK STAM

Retail PC sales will attest that older, single-pipeline microprocessors such as the Intel 80486 or the Motorola 68040 are giving way to new multiple-pipeline superscalar processors such as the Pentium and PowerPC. The first mainstream superscalar microprocessor, the Pentium, includes advanced features such as separate instruction and data caches and branch prediction logic. Intel's competitors AMD and Cyrix, claiming performance higher than Pentium, plan to ship their superscalar processors sometime in '95. Nex-Gen is already shipping its Pentium-class Nx586 chip, which is a scalar design from an x86 instruction perspective but a superscalar design from its internal RISC86 instruction set standpoint. On the RISC front, popular architectures such as PowerPC, Alpha, and PA/RISC are superscalar designs of varying complexity and performance potential.

If superscalar technology buzzwords like *register renaming*, *branch prediction*, or *speculative execution* frighten and intrigue you, then you need to read *Superscalar Microprocessor Design* by Mike Johnson. A Senior AMD Fellow in charge of the company's Advanced Processor Engineering group, Johnson has written the definitive text (and the only generally available text) covering superscalar design techniques. Most of the book is based on research conducted at Stan-

ford University (not at AMD), and many of the described design techniques are now seen in the new superscalar processors.

The book does not focus on any existing superscalar processor, such as the Pentium or the PowerPC, but rather describes various implementation techniques that are key to understanding the design of such processors. Using a simulation device based on a MIPS R2000 scalar RIS processor, and using instruction traces (short segments of predetermined instruction sequences) derived from standard benchmark test programs, Johnson is able to analyze the effects of applying various superscalar hardware

design techniques to the simulator. Throughout, Johnson keeps the reader well aware of design complexity and manufacturing costs of the various alternatives, including performance trade-offs and the law of diminishing returns. (For example, two or three times the amount of costly hardware logic dedicated to a particular task might buy a perfor-

■ A Super CPU

"Superscalar processors are the natural next step in the evolution of general-purpose microprocessors, beyond RISC processors. Superscalar techniques largely concern the processor organization, independent of the instruction set and other architectural features. Thus, one of the attractions of superscalar techniques is the possibility of developing a processor that is code compatible with an existing architecture." —Mike Johnson, *Superscalar Microprocessor Design*, page 9

mance improvement of only 2 to 3 percent in that particular function, so why bother?)

Johnson begins his book by introducing the reader to pipelining, CISC, RISC, and superscalar concepts. The next section dives into performance-limiting aspects of instruction execution, including dependencies (data and procedural) and resource conflicts. Detailed coverage of various instruction-issue policies—such as in-order issue with in-order completion, in-order issue with out-of-order completion, and out-of-order issue with out-of-order completion—are presented with accompanying charts that help shorten the learning curve. (Throughout the book, Johnson includes many diagrams and charts that effectively supplement the text.)

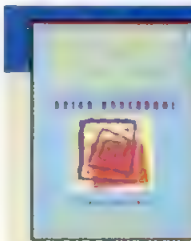
An introduction to storage conflicts (also called anti- and output-dependencies) leads to a discussion of register renaming, a technique that removes storage

conflicts from an instruction sequence. After describing the simulation techniques used for analysis, Johnson spends an entire chapter examining instruction fetching and decoding, including insights into the effectiveness of various branch prediction techniques. Another chapter is dedicated to the less hyped yet critical functions of processor recovery and restart operations that are required after processor exceptions or mispredicted branches. Further details of register renaming schemes, out-of-order issue methods, and memory dataflow are covered in later chapters.

Software scheduling—the ability of software to reduce dependencies and bottlenecks in code sequences—is described at great length and is contrasted with hardware techniques. Finally, in an appendix, Johnson describes how to design a superscalar 80386, which surprisingly touches upon many of the techniques to be used in AMD's forthcoming K5 chip and Nex-gen's Nx586. This book is not meant for beginners, but rather for readers with a burning curiosity and preferably a working knowledge of x86 assembly language.

► **Superscalar Microprocessor Design**, by Mike Johnson, \$58.00; Prentice-Hall, 800-947-7700; ISBN: 0-13-875634-1.

Circle 466 on reader service card



Read Only Recommends

Anyone who has ever used a PC has seen the dreaded DOS program message "Need more expanded memory," or the Windows version, "Insufficient memory to run application." The next time you have memory problems, read Brian Underdahl's *Quick Memory Management Techniques* before you start to edit your CONFIG.SYS and AUTOEXEC.BAT files. \$22.95, John Wiley & Sons Inc., 800-225-5945; ISBN: 0-471-05384-8.

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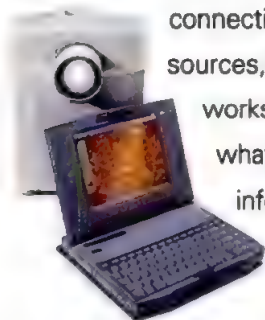
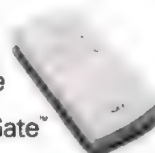


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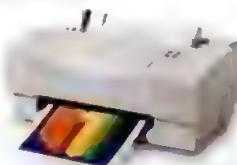
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Michael J. Miller

Once Lost, Can Trust Be Regained?

What's going on here? Can't anybody create great software and hardware anymore? Can't we trust computer companies anymore? Are we doomed to cynicism, to revel in the past, to say things like "They just don't make computer products the way they used to"?

First, Intel confirms that its Pentium processors have a problem with floating-point divides, but it doesn't announce plans to replace the chips for those who want new ones until it's faced with a torrent of negative publicity. Then Microsoft announces that Windows 95 will be delayed again, setting a new end-of-August target date for getting its much anticipated operating system in stores. Earlier, IBM recalled its OS/2 Warp for a short period because of a glitch in the program's installation process.

No doubt about it, a foundation of mistrust has certainly been laid. But why have we only started to notice—or care about—chinks in the computer-industry armor?

EXTRA! EXTRA!

To say that the computer industry is under a lot more scrutiny than ever before is to understate the obvious. When Intel's 386 processor had a math error, only a few techies really cared. Today, the Pentium is found to have a floating-point divide error and it's front-page news. Why? Because Intel has spent tens of millions of advertising dollars in the past year turning its name into a household word. And when mass-market consumers hear they're being sold defective products, they don't want rationalizations, they want recalls.

The Pentium problem was overblown, because most people would probably never notice it. If you only use your computer to write letters, go on-line, or play games, your CPU's floating-point functions just don't come into play. The Pentium problem is like a mistake on a highway sign. If you go by it very

quickly, you may well miss the error; if you travel more slowly—looking at every sign—you're certain to see the mistake. Someone doing spreadsheets is moving quickly down the road and probably won't notice the error. A person dealing with small numbers that change very rapidly—looking at each sign—is more likely to run into the error. Once again, if you primarily write letters, play games, or go on-line, you're not even on the floating-point road.

It's true that in today's computing environment we notice more errors than before. Computer products have become incredibly complex. It's really a software problem: There's more software than ever, and it's hard, perhaps even impossible, to check all the interactions of all the software. So no, they don't make computer products the way they used to; they can't.

Consider the Pentium chip. It contains more than 3 million transistors, compared with approximately 275,000 found in the 386. That makes the process of creating it, keeping it compatible with the existing base of x86 software, and adding new features extremely complex. One small software problem can cause a *lot* of problems. (The problem with the Pentium is the result of an error in a lookup table; it's a software problem.)



Intel has learned that consumers simply won't tolerate flawed products.

WHAT ABOUT WINDOWS?

Let's look at Windows 95. It's expected to contain roughly five to six times more lines of code than Windows 3.1. Obviously, it's harder to get all those extra lines of code right.

To make matters more difficult, Windows 95 also has to work with the thousands of existing Windows 3.1 programs and the thousands of different hardware configurations that work with the existing Windows interface. This makes compatibility a much more dif-

Michael J. Miller

difficult problem for a new OS than it was when Windows 3.0 first came to market five years ago.

Such problems are only going to get worse in the future, because the number of lines of code, and the number of existing products that a new OS is going to have to co-exist with, are only going to get larger.

In part, that's why you hear so much emphasis on things like object-oriented programming, which is designed to make well-tested software "objects" reusable. It's also why we hear so much about the need for standards in things like common APIs. And why I think people will eventually want a component-based architecture built on well-tested software components. This kind of architecture will be designed to control the kinds of interactions that one piece of software will have with another.

Will it work? Nobody knows. A few years ago, things like Computer Aided Software Engineering (CASE) tools were all the rage, but they don't seem to have solved

the problem. It's clear that some fundamental computer-science research is still needed.

TO ERR IS NOT ONLY HUMAN

In the near future, we probably aren't going to see the perfect chip, or the perfect operating system, or the perfect application. That's not too surprising; I've yet to see the car that runs perfectly and has no defects. But it means we have to understand the essential truth: Computers can and will make mistakes. Those of us who buy computers and software need to understand this. But although this explains why these errors and delays come up, it doesn't really excuse the vendors. Here's list of things I think we have a right to expect from the vendors.

- **Good faith.** Vendors shouldn't ship products that they know have potentially serious problems, especially not without explaining the problem ahead of time. Where there's a problem, the vendor (or vendors, because compatibility often involves multiple vendors) need to move as quickly as possible to create a solution and make that solution widely available.
- **Full disclosure.** As soon as a problem is known, vendors need to be forthright about admitting it, explaining what it is, and identi-

fying which customers are at risk.

- **Responsibility.** Pointing fingers at other vendors for their errors is at best a short-term win for the vendor, because everyone has some problems. Instead of pointing fingers, we want vendors to take responsibility for their own errors and for fixing their problems.

In the recent Pentium brouhaha, Intel let us down. The company didn't acknowledge its processor's error as soon as it knew about the problem. It kept shipping flawed chips for months between the time it confirmed the problem and the time it publicly acknowledged the bug. And it didn't move fast enough to assure customers that it would fix the problem by supplying replacement parts.

When Intel finally changed its mind and said anyone who had a faulty part and wanted it replaced need only call a toll-free number (800-628-8686), it went a long way toward ending the hysteria.

This is the kind of responsibility we have to expect from major vendors. We have to give a lot of credit to IBM for acknowledging OS/2 Warp's installation problems and suspending sales while it fixed the bug; and to Microsoft for having the good sense not to rush Windows 95 to market until it's really sure the code is ready to go. □



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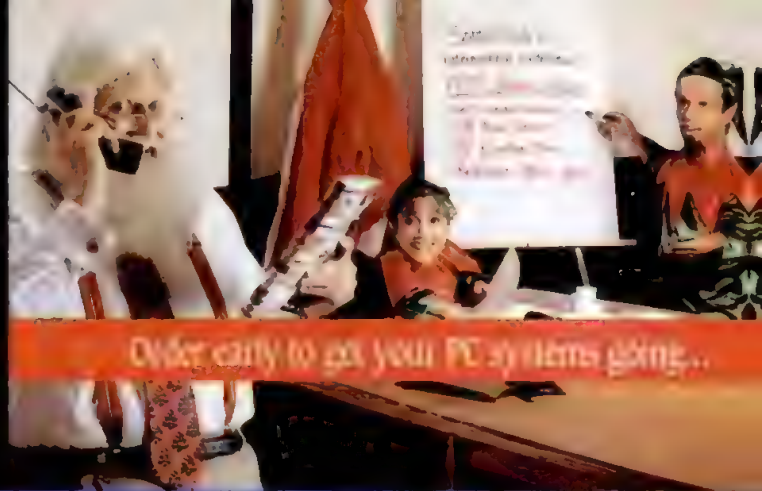
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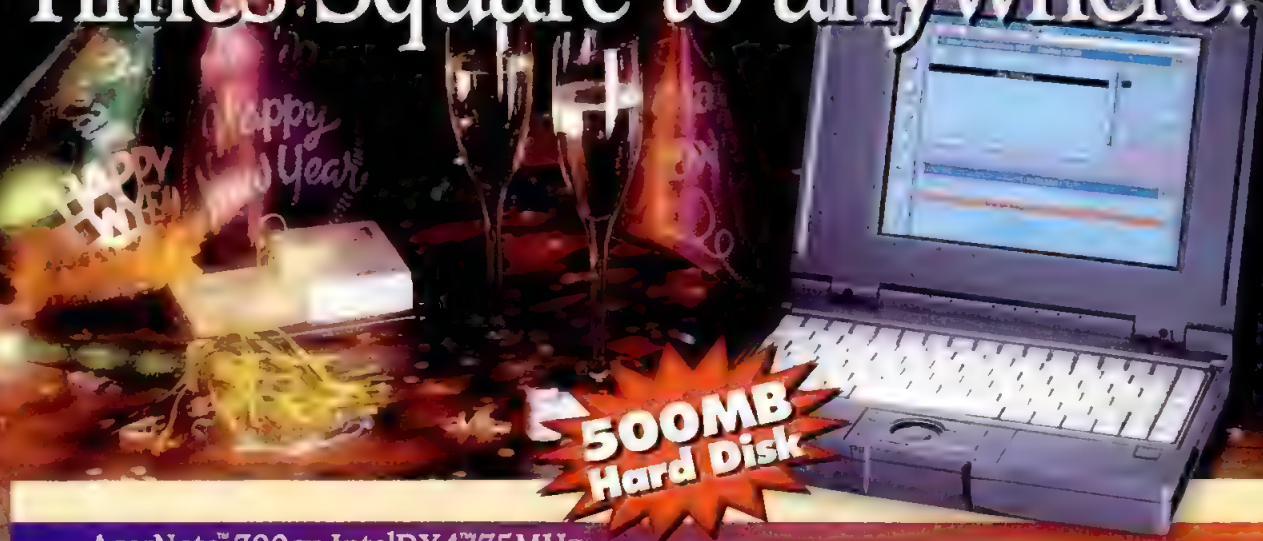


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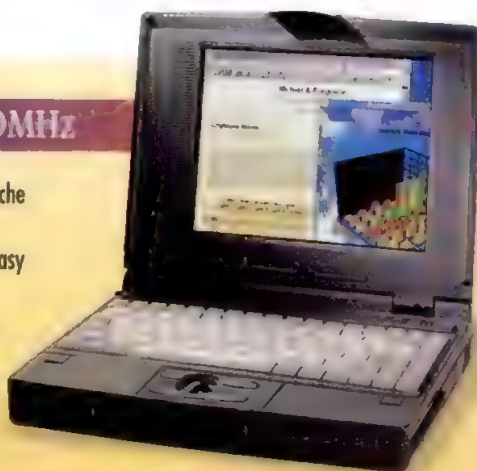
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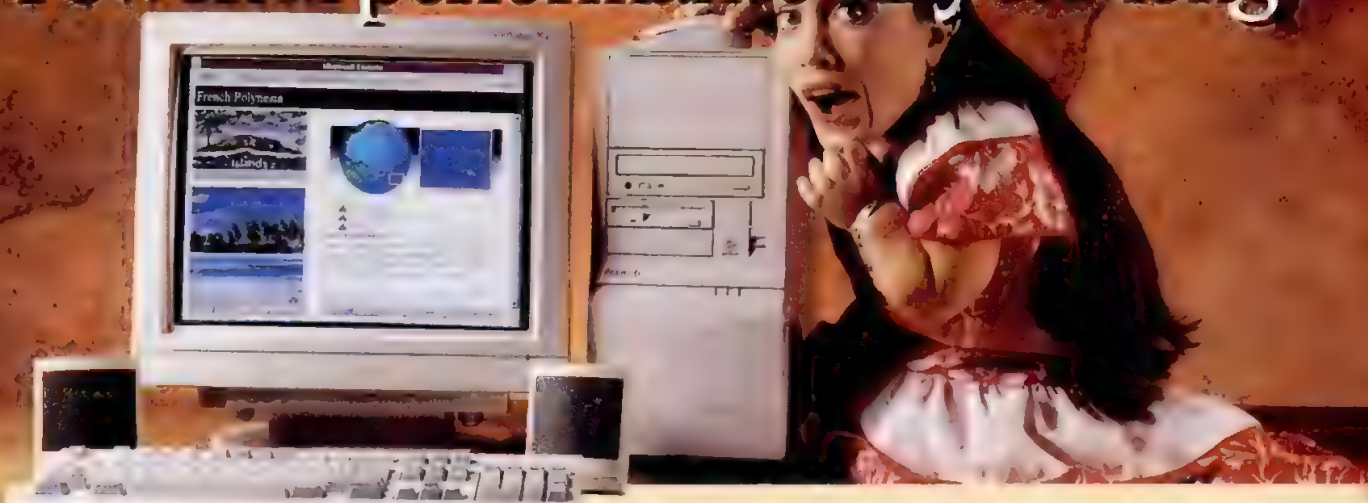
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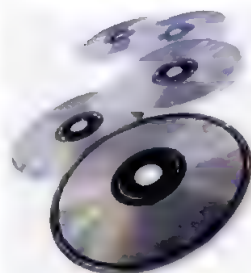


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Bill Machrone

Compulsive Communicators

For all our sophistication in electronic communications, things are still pretty crude. You can reach me in a stunning number of ways. You can call me by phone: If I'm in, we'll chat; if not, you can leave voice mail. You can send me a fax. You can send me

MCI Mail. You can reach me through our Lotus Notes gateway. You can reach me at my CompuServe e-mail address or leave a message for me in my section on the *PC Magazine* Editorial Forum (Go ZNT:Editor). You can send mail from a response hot button on my page under *PC Week's* World-Wide Web home page (<http://www.pcweek.ziff.com>). You can't have my pager or cellular phone numbers—but if you could, there'd be two more ways to get my attention. I've got at least four more electronic addresses, but they're by-products of various beta tests and Internet access companies, so they (fortunately) don't count.

I spend a significant amount of time every day checking and responding to these electronic in-boxes. I'm supposed to be available, but this is ridiculous. More pipes do not equal more throughput, especially when you introduce the inefficiencies of different user interfaces. Yes, you can steer various mail services to a common in-box or use a mail management product that gathers your mail under a single interface, but they can never do the whole job. For instance, when I check my e-mail on CompuServe, I also browse half a dozen forums where I'm likely to find breaking news on industry goings-on. Notes, of course, is far more than e-mail. I can check a variety of databases for critical information.

Even as we use them, the various communication techniques are specializing. For instance, using the telephone and voice mail are not the same thing at all. Many times I've picked up my phone and heard the caller say, "Oh, Bill! I didn't really need to talk to you; I just wanted to leave a message on your voice mail to confirm the time of the meeting/remind you to mail the form/tell you our booth number." These callers just

want to convey some information rapidly and efficiently and don't want to tie themselves up by actually having a conversation. It's conceivable that you could list one number on your business card for voice and another for voice mail.

This proliferation of mailboxes and phone numbers is wrongheaded. The real solution lies in having one master number per person. After all, you want to talk to a person—not to a telephone. AT&T has been working on this problem for years, and a small number of very lucky executives are testing a system that lets their messages follow them wherever they roam. In the PersonalReach system, you have a single phone number; the person trying to reach you waits on hold while the system tracks you down by calling your pager. You call in from wherever you are and tell the system that you're at one of your standard locations or give a number where you can be reached. PersonalReach then connects the calling party with you, eliminating the need for call-backs. The system can also forward your calls to a specific number until you tell it to stop. If you don't answer, the person gets your voice mail, instead. Happily, you can tell the system to hold your calls, too. This is a good solution for everyday voice com-

munications, but it hardly scratches the surface of the overall problem facing today's professionals, whether they're mobile or not.

DREAM SYSTEM

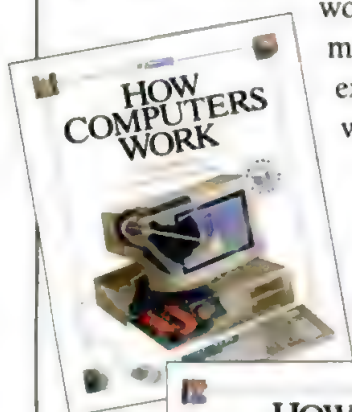
Wouldn't it be far simpler to have a single number that accesses a database of your communications capabilities and preferences? You dial my number and with no further instructions the call is routed, as with PersonalReach, to the telephone I've designated as the one I'm most likely to be answering. If I don't answer, you get my



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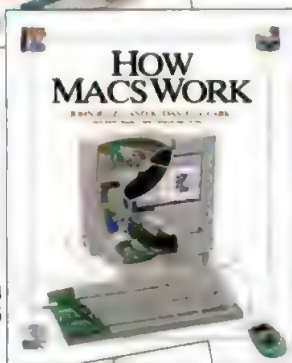
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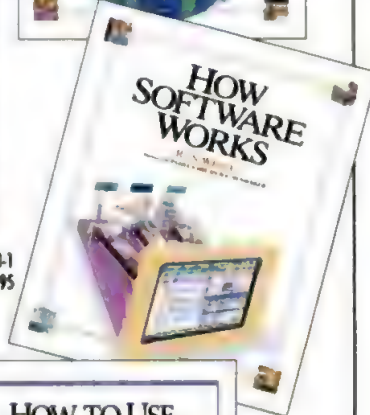
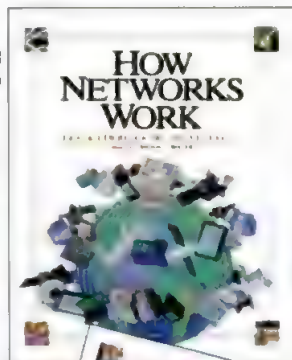


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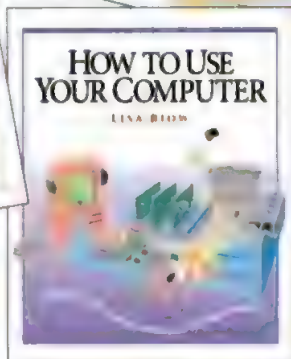
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Bill Machrone

voice mail. But let's say you only want my voice mail. You should be able to dial that same number but add a suffix or some other code after the designated system answers and before a voice connection is made. At that point, you would have the option of leaving voice mail.

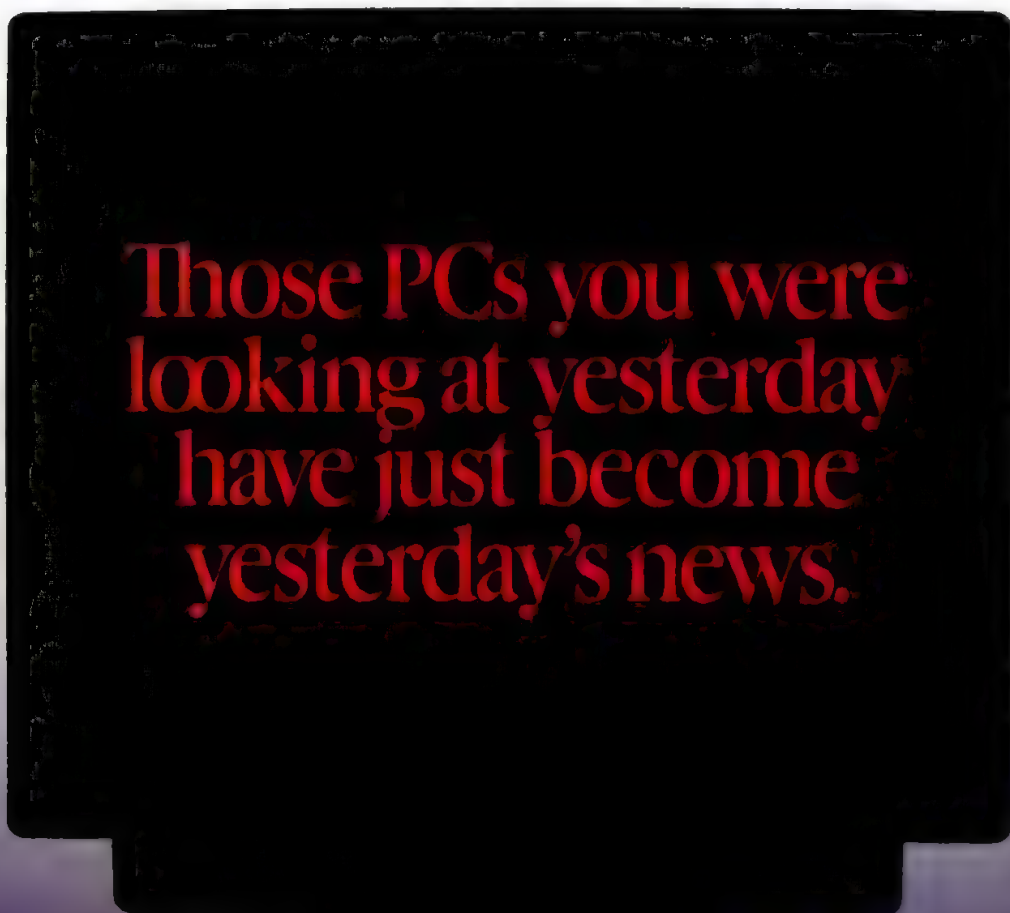
Now let's say you want to send me a fax. You call the same number, but with a suffix that says that this is a fax. The system then routes it to my office fax if I'm in the office, to my notebook fax modem if I'm on the road, or (if I'm a glutton for punishment) to my home if it's urgent. The central system might also offer format conversion, so your fax bitmap shows up as text in my e-mail in-box. As for e-mail, my master phone number should be my address; the database would steer messages to the in-box of my choice.

The operation of the master system should be driven from your daily calendar. You could transmit your commuting schedule and travel plans to the central switch and have it route calls accordingly. It's hard to imagine, but some people *want* to be reached while they're traveling on airplanes. This system would let them, without the rigmarole that you currently have to go through on planes that are equipped with two-way phones. When you get to your destination, the system would then route your communications there.

Once you start adding suffixes to a personal phone number to signify the kind of link you're trying to make, it's a short hop to adding information on a data call to signify its priority and type. A normal-priority scheduling message, for instance, would be handled by a software-based calendaring agent. The agent could negotiate a meeting time and location on your behalf and then simply ask for your approval or offer you several options. A high-priority alert transaction would page you, make your notebook beep, or otherwise track you down until you respond.

Now on to the serious questions you'll face. Will you have one number just for your business life and another number for your personal life? Will you take your business number with you if you change companies and just update your profile? Can this function even be built into the next generation of telephone switches, or would it simply be front-ended by what amounts to high-capacity name servers? □



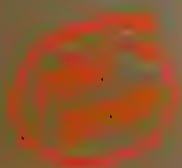


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CIRCLE 345 ON READER SERVICE CARD



John C. Dvorak

A Modest Pentium Proposal

The furor over the faulty floating-point abilities of the Pentium chip and the subsequent naysaying, finger-pointing, down-playing, denial, exaggeration, and general weasel-like activity have marked a low point in the history of personal computing.

I have a modest proposal for Intel that should make everyone happy.

First of all, Intel's minimizing the problem with claims that an error would occur only once every 27,000 years is unconscionable. It's probably this ludicrous claim that forced IBM to release more realistic numbers indicating that a spreadsheet user could run into a calculation failure once a month.

While the IBM numbers are debatable, the company did point out that many users were probably getting bad numbers without even knowing it. This explains why nobody was complaining to Gateway and Dell, two of the most aggressive promoters of Pentium PCs. Comments by these companies, as well as those by large financial institutions with serious amounts of Intel stock, were disingenuous and self-serving to say the least.

We in the media have to ask ourselves why the discovery of the flaw was a grass roots effort that first surfaced on the Internet instead of in one of the computer magazines, *The Wall Street Journal*, or some testing lab. Obviously nobody had thought to look. I mean, Intel has engineers to check for this kind of thing, doesn't it?

As I ponder this, I'm reminded of a comment made by Andrew Schulman, the author of *Unauthorized Windows 95*, as he outlined for me exactly how the basic underpinnings of Windows 95 are the same old DOS/Windows combination gussied up to appear like a new OS written from scratch. It turns out there is a DOS structure deep within Windows 95, as well as other internal flaws. He said that nobody was talking about this stuff and the press was simply parroting whatever Microsoft told it. The same could be said of the media's relationship

with Intel, which now blames the press for all the bad publicity. Intel had things going its way when the story first unfolded. The media gladly quoted financial analysts, including one guy who, three days after the announcement, said the flaw was unimportant and would "blow over by Monday." Many of the press reports were lightweight and superficial, generally quoting one hardly objective source after another. These were people tight with Intel—people who had a lot to gain from Intel's success.

But the problem snowballed, getting larger and larger. It grew because what was overlooked in the whole matter was the truth. Not just the truth about the bug or the truth about how many times you will come up with the wrong result. I'm talking about the truth about computing. Computers are perceived as devices that do calculations at blazing speeds and do them flawlessly—first time, every time. If they are not perfect, then they are not doing their job. There is absolutely no excuse for an error in a calculation.

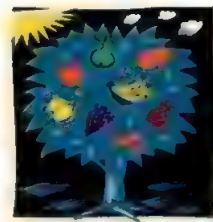
On the other hand, I have yet to install the "fixed" Pentium chip that Intel supplied to me. I didn't want to deal right away with the hassle of installing the new processor, because the only mission-critical use I have is file transfer. But that's not the point. I expect my computer to do other things once in a while without my having to worry about the results.

While Intel has finally offered a total Pentium recall, I think it should go a step further and offer owners a choice of a free replacement Pentium processor or, for an additional \$100, a new, faster upgrade chip. Intel would have a public relations coup and maybe make some money on this fiasco. Until this happens, the resale value of the faulty Pentium systems will be nil.



*The Pentium crisis grew
because the matter of truth
was overlooked.*

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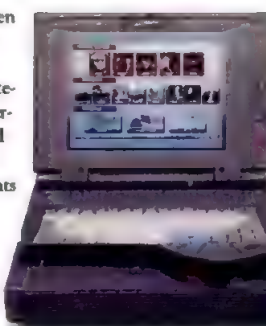
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Inside Track

If you haven't been following the **magneto-optical revolution** in mass-storage devices, you'll be in for a rude awakening this year when all hell breaks loose as **competing standards** and new technologies hit the streets.

Over the past year, the 128MB 3.5-inch optical disk has taken the graphics community by **storm** as an alternative to **SyQuest's dominance** of this market. Artists create very large files that need to be transported to service bureaus for printing, and the standard format has been the SyQuest removable media—at least up until now. But SyQuest's blank disks cost nearly \$100 each. The trade-off is that the SyQuest drive is **cheaper and faster** than any of the available alternatives. Still, most big service bureaus have adopted the ISO-standard, 128MB 3.5-inch magneto-optical disk as an alternative, and last year most of these drives were upgraded to 230MB while remaining compatible with the 128MB disks.

A new ISO standard due out later this year will up the capacity of the 3.5-inch format to **640MB**. The new drive will be able to read and write the old 230MB format but only read the really old 128MB format. This will become the definitive drive unless the opponents have their way. And there is an interesting **battle brewing**.

The 3.5-inch magneto-optical world has divided into **two camps**. Both agree on one fact: The current technology used to make the backward-compatible ISO drive will probably not be able to go much further. That's where Sony's new overwrite technology picks up. This summer Sony will introduce a **650MB** magneto-optical drive that will be supported by Hitachi, 3M, and others. The drive's capacity can be doubled over and over to eventually store **multigigabytes** on a 3.5-inch platter. The Sony-developed drive eliminates the erase sequence and reduces the number of head passes from three to two. Traditional optical heads pass over the write spot three times to erase the old data, write the new data, and verify the operation. Elimination of this step means **increased speed**. So Sony, Hitachi, 3M, and others are in this new camp while IBM, Fujitsu, Panasonic, and others are staying with the new ISO design that's an apparent dead end.

To muck things up even further, Panasonic has another group developing a 5.25-inch, half-height, dual-purpose drive that can read a standard CD-ROM, but can read and write on a special CD-ROM-size, 650MB optical cartridge. The Panasonic drive uses **phase-change technology** instead of magneto-optical design. This is

Panasonic is developing a 5.25-inch drive that can read a CD-ROM, and read and write a 650MB optical cartridge. It uses phase-change instead of magneto-optical design and could be the secret for Compaq's next Pentium PCs.

not a writable CD-ROM but a read/write disk that slides into the same slot as does the CD-ROM. According to rumors, this is **the secret drive** Compaq will introduce in its next generation of Pentium PCs.

You'll want to keep an eye on phase-change technology, which works by using a laser's heat to selectively change the phase of the substrate back and forth from crystalline to amorphous structure in order to encode data. No magnetism is used, so it is presumably less expensive to design and make. **Toshiba has a 1.3-gigabyte 3.5-inch drive** in the works that uses this technology.

For raw capacity, the definitive magneto-optical drive still

comes from MaxOptix's Tahiti line. The Tahiti III puts 1.3GB on a 5.25-inch disk and is backward-compatible with the older Tahiti disks. This drive has a **phenomenal** 19-ms access time.

Microsoft as One Big Conspiracy Dept.: Daryll T. Fogal wrote me with yet another conspiracy-like observation: "Microsoft is going to try to create the knowledge navigator that is almost exactly like the one demonstrated by John Scully a few years ago." It will be here in 1995. Doubt it? Listen to this:

"1. Windows 95 supports Open GL, which accelerates 3-D rendering. You off-load this particularly CPU-intensive task to a graphics card (such as the Matrox MGA Impression Plus).

"2. MS bought the rights to the Hash animation technology. Martin Hash is the guy who created the dancing Claymation California Raisins and recently developed a spline-based animation technology that can represent a sphere as two intersecting splines, instead of as 10,000 polygons. The models are so easily manipulated, with so few control points, that an on-line service could download 20 spline-control data points every second to animate a spline mesh. This technique was just used to generate an animated head at SGI so that it looked like a modified videotape.

"3. MS is devoid of new ideas and has copied Apple's best ideas for years.

"4. MS reportedly has a synthetic voice-compression program based on a simulation of the human voice box." Apparently, its data requirements for creating a realistic-sounding voice simulation are very low.

'Nuff said. Expect to see Microsoft Munchkins talking right at you. Of course, IBM has already done all this technology for its **human-centric interface**. Guess which of the two companies will make all the money for such a concept? □

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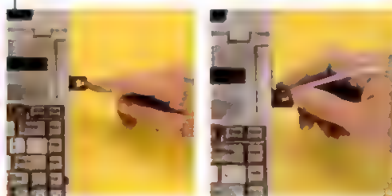


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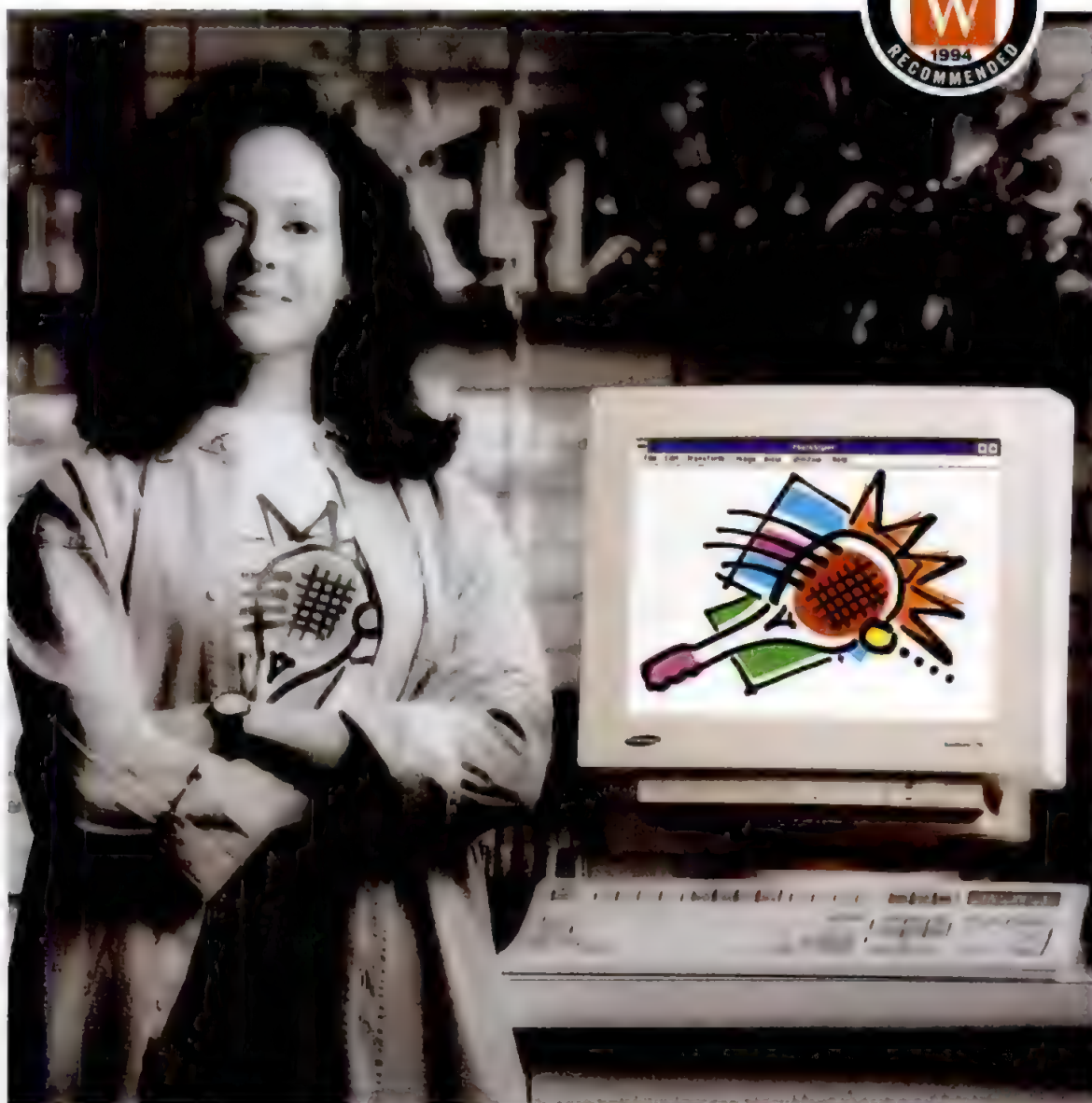
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Jim Seymour

Record Your Own CD-ROM

Prediction No. 1: Sometime this year you'll at least think seriously about getting a *recordable CD-ROM* (CD-R) drive of your very own. Prediction No. 2: If you do buy one, you'll love it. And probably hate it, too—at least at first.

When CD-R hardware cost about \$7,500 and blank recordable disks were \$20 and up, both fell into the "special-purpose tools" category; if you really needed them you might spend the money, but you had to be awfully sure before you took the leap.

Now prices are falling, and the promise of recordable CD-ROMs is becoming a reality. New drives are selling for half the price they did six months ago, and blank disks are selling for around \$10. Writing your own CD-ROM is thus becoming a lot more practical. And CD-R prices are going to fall further. Not into the "five and five" nirvana that my friend the CD-ROM Maven says is the market magic point for CD-Rs—\$500 drives and \$5 blank disks—but far enough that we'll start seeing a CD-R drive as just another peripheral.

But there's still confusion about why you'd want a CD-ROM recorder and how you'd use it. And the process of making your own CD-ROMs ("All the cool guys say *burning* your own, Dad, not *making* them," my little boy would say) is full of little gotchas.

BUT WHY?

Cheaper drives and media are important, but the big issue is smart software to control the process. CD Creator, a new package from Corel, is so quick and easy to use that it is sure to play a major role in moving CD-Rs to center stage. In many ways, creating a CD-R isn't like creating any other PC disk (optical or magnetic). The genius of CD Creator is that it hides the complexity and makes creating your own CD-ROMs a familiar process.

Before we get to the nuts and bolts, let's look at why you'd want to make your own CD-ROMs. For multimedia publisher wanna-bes, the answer is obvious—but

few of us will join Grandma, Arthur, and Peter Gabriel on the CD-ROM best-seller lists. For most of us, CD-Rs are going to be extensions of how we use PCs now.

The most common use proposed for CD-Rs is backup, but not in the way we usually use that term. Usually, you back up hard disks as a hedge against disk failure. Rotating a few tapes through a grandfather-father-son backup cycle assures that you have at least one tape that works. A bad disk is repaired or replaced and then restored from the most recent tape. It rarely works that simply, but a stack of backup tapes protects you pretty well against The Worst.

With today's big hard disks, backup-medium capacity has become critical. It's much easier to restore a hard disk from a single tape, so matching tape capacity to drive size has become standard operating procedure. Yet though the 680MB capacity of a CD-R at first seems vast, it's not large enough to back up many of today's hard disks. On new PCs, 500MB and larger drives are becoming the norm; with 1GB E-IDE drives selling for less than \$500, upgrades are pushing past CD-R capacity, too.

I don't think many of us will be routinely backing up hard disks to CD-Rs. It's not very convenient, and it isn't

particularly cost-effective. With 4MB to 8MB DAT drives priced under \$1,000, and 4MB to 8MB tapes selling for \$15 or so, why use a \$2,500 CD-ROM recorder and \$10 to \$15 blank disks to create nonreusable backups? The tape market is safe for now from recordable CD-ROM drives.

SPECIAL PURPOSE

CD-Rs are going to foster new kinds of special-purpose backups that will be highly cost-effective. One example is a database that needs to be widely distributed in a company. Throwing 500MB of customer or



With drive and media prices falling, writing your own CD-ROM is becoming a lot more practical.

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Jim Seymour

product data on a CD-R is quick and easy. You can make a few duplicate disks yourself for \$10 each, or you can have a thousand duplicate disks made in a week for less than \$2 each.

A second important new category of backups will be audit-trail copies. With the constant recycling of backup tapes—and with the ease of altering a magnetic-tape record—few companies have snapshots of the exact state of company records at a given moment. But increasingly, permanent computer-readable records of the precise form and content of this material are both required by the government and a prudent defense against potential litigation.

Dumping batches of records to CD-Rs allows you to create that archive. Of course, you can also dig your own grave this way if the documents stored in your CD-R archives are full of those smoking guns lawyers and regulators love to look for. Caveat recorder.

Finally, what I call ad hoc personal archives now make sense with recordable CD-ROM technology. As I work on books, for example, I discover how easy it is to print a complete working draft to a CD-R—indeed, to gather all the interim drafts for a project on a single CD-R. When I inevitably realize something was a lot better in Version 3 than in Version 7, it's easy to go back and excavate that better draft.

Sure, it would be possible to do this on a hard disk—but you and I don't do that. Our episodic compulsion to clean up the hard disk often has fatal consequences: Files with obscure names that went unchecked before we erased them (or files that were simply deleted in error) are lost forever.

Since I've been using a CD-ROM recorder, I've been moving old files to a new directory on my hard disk and then flushing them to a CD-R in batches of 25MB or so. I could do this to a backup tape—but I don't. And when I'm searching that ad hoc archives disk, I can use my usual DOS/Windows searching tools instead of the leaden tools of tape-backup software. It can take forever to search tape, which is a linear medium, when you're not exactly sure what you're looking for; CD-R, which is nonlinear, makes the process far faster.

Enough whys. Next issue, I'll look at how to avoid the nasty little gotchas that can make getting into CD-Rs a painful, expensive process. □

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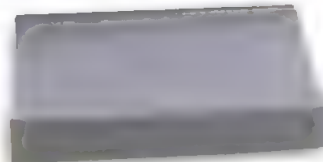
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Bill Howard

1,200 Ways to Worry HP

I recall that A. J. Liebling once said, "Freedom of the press is guaranteed only to those who own one." But if you want to do more than just publish—if you want to publish *persuasively*—then you'll need more than just any old printing press. You'll want

the best equipment you can lay your hands on.

Today, most of the pieces for quality personal publishing have fallen into place: hyperfast PCs with lots of disk storage, superb desktop publishing and design programs, word processors with newsletter-caliber formatting abilities, and high-quality clip art.

The missing link has been the printer. Low-resolution desktop printers capable of 300 dots per inch were okay for nonitalic text and 600-dpi printers were adequate for small fonts and line art. Nobody, however, is going to be fooled into thinking that a scanned photograph printed on a 300- or 600-dpi printer is of professional (service bureau) print quality.

DOUBLE THE DPI

I've been working the past several weeks with a printer that really closes the gap between laser printing and typesetting: the new Lexmark Optra laser printers, which produce 1,200-dpi output. This is a stunning achievement. These printers produce *true* 1,200 by 1,200 dpi, not 600 dpi interpolated to 1,200 dpi in one dimension. Priced to compete with the HP LaserJet 4M Plus, the 12-page-per-minute Optra R costs less than \$1,500. This news should make Hewlett-Packard a little bit jumpy.

Here's how I'd describe the Optra R's print quality: For text and continuous-tone line art, you won't be able to distinguish the output from a quality photocopy of a typeset document. At 1,200 dpi, gray-scale rules (benday tints) will appear as a seamless gray line, not as individual dots constituting a line. Photos will look as good as newspaper photos—if you scan and print carefully.

You should understand what a 1,200-dpi laser printer will not do: It won't replace a traditional 1,200-dpi Linotronic typesetter

that uses photographic film and chemical developing. While both can place pixels at intervals of $1/1,200$ inch, the Linotronic pixel is a smaller and vastly more precise order of magnitude. But there are now fewer and fewer tasks that will automatically require the use of a typesetter.

If you have, in the past, laser-printed type-only masters for your company newsletter and then had the photographs halftoned and stripped in separately by a commercial print shop, you can now scan them in and print them out on a master page, which you would then take to the print shop. If you were unwilling to add product photos to your company's product spec sheets because laser-printed output would look amateurish—while traditional halftoning would be cost-prohibitive—now you can.

DOUBLE THE COMPETITION

Although high resolution is the Optra's calling card, there are enough other good things in this line of five 12- to 16-ppm printers to constitute the most serious threat to HP's laser-printer hegemony since the first LaserJet appeared 11 years ago. The Optra's MarkVision network management tools are an easy match for HP's JetAdmin utility, its front-panel controls are fath-

omable without the manual, its on-screen controls are first-rate, and its PostScript Level 2 emulation software is robust enough to make Adobe rethink the asking price for genuine PostScript. (The Optra printers also include PCL 5 emulation.)

Combine the Optra line's technical tour de force with the color laser printer offerings from other vendors that have superior print quality—such as Xerox and QMS—to HP's Color LaserJet, and you suddenly have a printer market with some real competition again. □



*A printer capable of 1,200
dpi can free you from
the service bureau blues.*

**AT 600 DOTS PER INCH IT MAKES
(AT THIS PRICE, IT ALSO MAKES YOUR**

Lewis Holt & Evans
Financial Advisors

Every serious investor knows, a diversified portfolio is a strong portfolio. And the need to diversify now clearly extends beyond the United States. In fact, almost two-thirds of the world's stocks are outside this country. That alone warrants a serious look at your holdings, or even if you are in a dead market, the potential gains of global investing are quite impressive. The report from International Securities from 1973 to 1993, a \$10,000 investment in overseas stocks returned over \$158,000. However, that same \$10,000 investment in the U.S. stock market returned only about \$120,000. Such reward, as you know, does not come without risk. And international investing carries its own special...

This approach, quite often involves a search for foreign countries that have a stable economy while offering excellent growth potential. Within that selection, certain industries are chosen that also offer growth potential. And when these industries have been identified, specific stocks are selected which are then added to the investor's portfolio. This approach has been successful in the U.S. market, and with the right selection, the same success can be achieved in foreign markets.

1968
100% Foreign Stocks

1993
100% Foreign Stocks

NEC SuperScript 4411

YOUR LETTERS LOOK PERFECT. NUMBERS LOOK PRETTY DARN GOOD.)

For less than \$800, the new NEC SuperScript™ 660i laser printer will make everything look exceptional. Including your budget.

In fact, everything will look great except the Hewlett-Packard® LaserJet® 4P. It simply falls a bit

short by comparison.

First of all, let's talk about one big difference. Speed. Our

660i is simply faster. It

prints six pages per minute.

Their 4P printer turns out only

four pages per minute. That's

significant when you think of all the

time you could save during your

typical, no-time-for-lunch,

a-thousand-things-to-do

workday. Like today.

Another difference you'll

notice is the option to upgrade to

PostScript™ emulation software.

It costs only \$99* to make

this upgrade with our 660i

printer. If you want to

upgrade the 4P printer, it will

cost you hundreds of dollars

more. And speaking of

price, let us

point out

perhaps the

most logical

argument for buying the NEC

SuperScript 660i: it does more, it

costs less. For all the advantages we

listed above (and more) we ask less

than \$800. On the other hand,

you will find that

Hewlett-Packard

asks you to part

with more. Quite a bit more.

By the way, with our 660i

you get a two-year limited

SuperScript 660i

Prints 6 ppm

PostScript emulation
upgrade \$99*

2-year limited
overnight warranty

Average Street Price \$800

HP LaserJet 4P

Prints 4 ppm

PostScript emulation
upgrade \$412***

1-year return to
dealer policy

Average Street Price \$920**



The 660i is a PCL[®] based laser printer,
for DOS or Windows[™] users.

overnight replacement warranty.

HP gives you just a one-year return-to-dealer policy.

The SuperScript 660i from NEC. It's simply a better value

than the HP LaserJet 4P. For additional information, just

call 1-800-NEC-INFO. For

details via fax, you can call

FastFacts[™] at 1-800-366-0476

and request

document

number

796604.

**SEE, HEAR
AND FEEL THE
DIFFERENCE[™]**

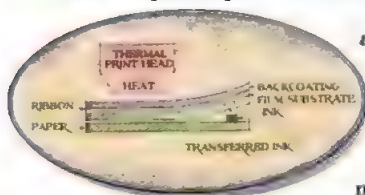
NEC

OUR NEW PRINTER MAKES AND THOROUGHLY CONV (MUCH LIKE THE ONE WE'

At this very moment, it's our job to dazzle you, persuade you, and sell you on this great idea we have.

Of course, you already have that job, every day.

And that's exactly why you should consider the new NEC SuperScript™ Color 3000 printer for Windows™



and the SuperScript Color 3000M for Macintosh®. If you make overheads, if you

Thermal Transfer Process make slides, if you make graphic presentations, they simply make your work look clear, precise, and professional.

You see, the SuperScript Color 3000 is a thermal transfer printer. And, when it comes to color, it is far superior to an ink-jet printer. Ink-jet printers can leave you with washed-out colors. Not so with thermal transfer.

What's more, this NEC printer allows you to choose between three different modes of printing. That's because, as you know, color printing can get expensive, and there are times when you need a color print but not a deluxe photographic-quality print. The SuperScript Color 3000, unlike most printers out there, gives you a choice.

Photo Color™ mode gives you the ability

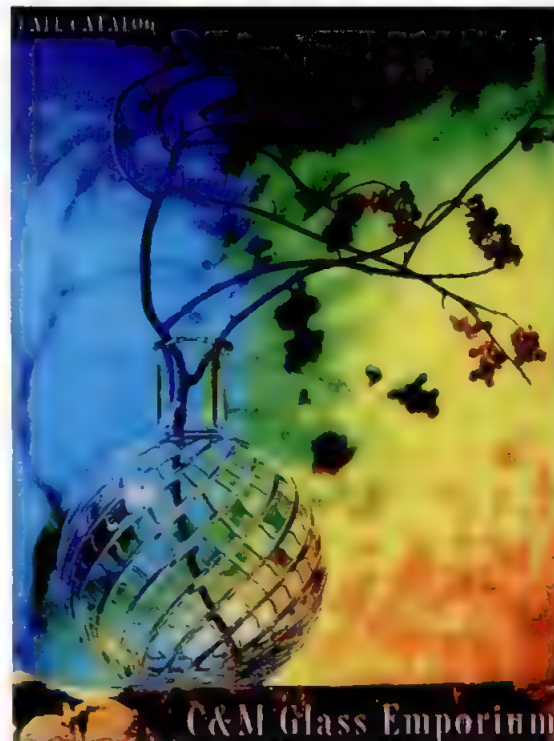
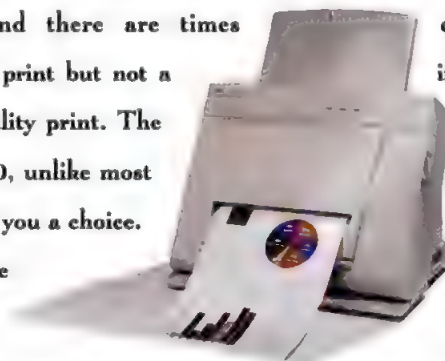


PHOTO COLOR MODE

to print incredibly sharp, vivid photographic-like color images. In short, professional-looking images that will add polish to any presentation.

With our Graphic Color™ mode, the size of the dots on the page are controlled to give you near-photographic quality, but at less cost per page than the Photo Color mode. Finally, the Thermal Transfer mode is ideal for charts, graphs and

A COLORFUL, DRAMATIC INCING PRESENTATION. RE ABOUT TO GIVE YOU.)



The retail division has expanded beyond its original "boutique" character to offer the complete range of glass designs to both consumer and corporate clients. Serving a growing need in the corporate environment for glass sculpture and design, CAM now maintains ongoing relationships with 115 companies.

from human and primary business interest since 1929

CAM Glass Emporium

GROWTH OF OUR RETAIL DIVISION

The decorative glass industry has encountered many changes over the past decade. Just 10 years ago, the over-pornulent and vulgar designs of today were virtually non-existent. Now, with the advent of several advanced techniques, countless designers, both here and abroad, are looking new ways to raise the level of expression in glass sculpture and glass design.

At CAM Glass Emporium, we concentrate on more than just glass. We also concentrate on light. After all, light is what brings glass to beauty, its shine, its reflection.

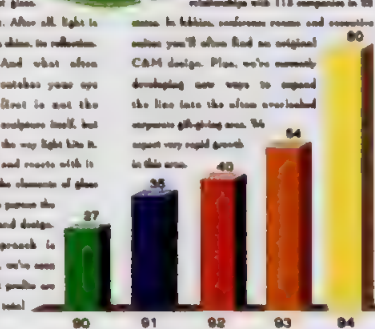
Its basic understanding of the elements of glass and light has allowed CAM to pursue the highest end of glass sculpture and design, and we have built on this approach to creating.

This basic understanding of the elements of glass and light has allowed CAM to pursue the highest end of glass sculpture and design. And we believe this approach is working. During the past year, we've seen gross sales increase 84%. Not profits are at an all-time high. And the total

number of franchised retailers has grown to 37. In a year when we expected to add 8 additional franchises, we have added 11 additional operations.

The retail division has expanded beyond its original "boutique" character to offer the complete range of glass designs to both consumer and corporate clients. Serving a growing need in the corporate environment for glass sculpture and design, CAM now maintains ongoing

relationships with 115 companies in 28 states. In lobbies, conference rooms and executive suites you'll often find an original CAM design. Plus, we're currently developing new ways to expand the line into the often overlooked corporate gift-giving area. We expect very rapid growth in this area.



GRAPHIC COLOR MODE

diagrams. And you can use it to make rough color drafts, which will certainly save money over the long haul.

On the subject of saving money, the NEC SuperScript Color 3000 will cost you less than \$1,000. For a color printer with three different printing modes, that price, quite simply, is just hard to beat. (We invite you to compare.)

Well, that concludes our presentation. Now it's

THERMAL TRANSFER MODE

time to close the sale. For additional information regarding SuperScript color printers, simply call 1-800-NEC-INFO. Or have information sent to you, via fax, by calling NEC FastFacts™ at 1-800-366-0476. Request document #7723000 for Windows or #7723006 for Macintosh.

**SEE, HEAR
AND FEEL THE
DIFFERENCE.™**

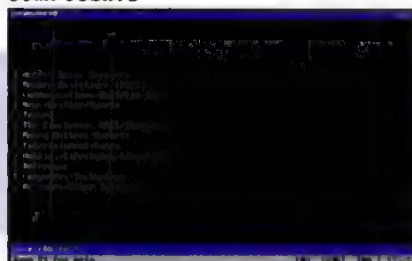
NEC

ON-LINE SERVICES

The Changing

Richer content.
Better interfaces.
You need to be
on-line, but
where's the best
place to be?

COMPUERVE

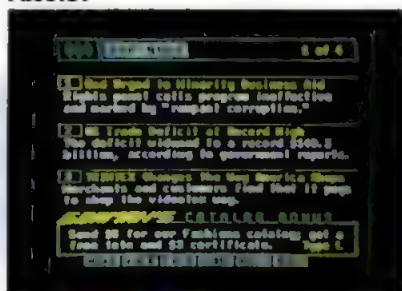


In a world before DOS, circa 1979, CompuServe's simple menu format was enough to engage pioneering users taking first steps.



By 1989, CompuServe had a DOS-based interface called CIM, with pull-down menus and mouse support.

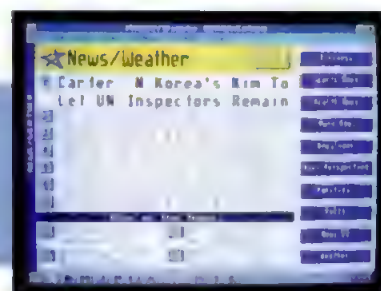
PRODIGY



Even in 1986, when Prodigy was known as TRINTEX, advertising panels scrolled across the bottom of the screen.



Prodigy's DOS interface, which appeared in the late 1980s, became more graphical but still had clunky, large-type text.



The current Windows interface, new in 1993, has a cleaner design and is more navigable but retains vestiges of the old interface.

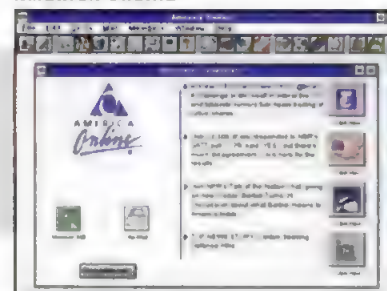
By Rick Ayre and Robin Raskin

The on-line world is growing fast and changing fast—and it's changing dramatically. The big commercial services we reviewed last year have gotten bigger, both in the number of users they claim and in the amount of content they offer. America Online, the fastest-growing service, says it passed the 1.25-million-user mark last November, which means it more than doubled its membership in the past year.

As for content, more and more resources are becoming available on-line. You can't open a newspaper or magazine without reading about its burgeoning on-line presence. Most likely, you've been meeting your favorite shopping spots, financial analysts, sports heroes, or entertainment stars in their on-line personae, too.

But as the commercial on-line services grow, they grow disquietingly more alike as well. For starters, they are all getting easier to use, relying heavily on graphical Windows front ends. And they are all targeting the

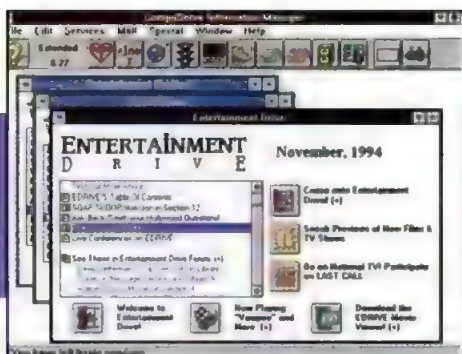
AMERICA ONLINE



America Online gave its very appealing service a good graphical Windows interface in 1993.

Face of On-Line

The Future



CompuServe's WinCIM is even easier to use with enhanced menus like this one, added in 1994.

THE MICROSOFT NETWORK



Scheduled to ship in 1995 as part of Windows 95, The Microsoft Network will challenge on-line institutions.

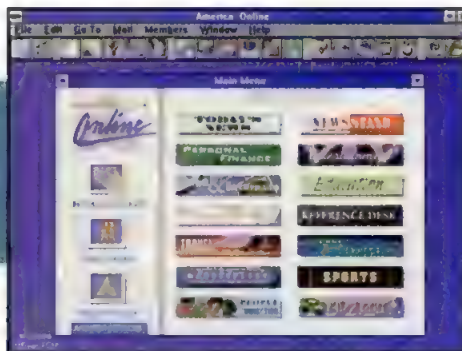


Here's the bold new look of Prodigy for 1995. With its improved graphics and true Windows functionality, it will keep Prodigy a frontline competitor.

INTERCHANGE



In 1995, Interchange will combine detailed content areas with advanced software tools for providers.



This new version, released in late 1994, highlights America Online's attention to content coverage, timely information delivery, and strong services.

IN THIS REVIEW

America Online	127	Internet Trail Guide	118
CompuServe	128	Suitability to Task	120
Delphi Internet	138	Cost Comparison	128
Dow Jones with MCI Mail	145	Coming Attractions	132
Gene	150	The Scavenger Hunt	136
Prodigy	152	Information to Go, Please	141
Highlights	110	A Change of Face	142
Editors' Choice	111	The Line on New Services	150
Seven Ways to Save Time and Money On-Line	114	Information Providers at a Glance	159
Quick Take on Content	116	Routes to the Net	166

same users by cultivating similar content. CompuServe alone used to target the business user, but now Prodigy says it is expanding its offerings for business users while continuing to maintain its traditional family focus. America Online is doing the same thing.

This time around, though, we still saw enough difference in content and presentation to designate two Editors' Choices: CompuServe for business use and America Online (AOL) for personal use. But stay tuned. Both Prodigy and AOL are cultivating strong Internet strategies and better business content.

The coming year promises to change the face of on-line once more thanks to the launch of The Microsoft Network and Interchange, two "next-generation" on-line services. Both of these bring object-oriented architectures, rich page layout, and interesting hypertext and linking capabilities to on-line services (see the sidebar "Coming Attractions"). The Microsoft Network is intended to ship as a part of Windows 95, thus posing a formidable threat to the existing on-line services.

Further changing the landscape is the increasing importance of the Internet

community. Each of the commercial services now includes an Internet access strategy in its plans. America Online was the first commercial service to offer users access to Internet newsgroups, but now you can read them on CompuServe and Prodigy as well. gopher, telnet, and FTP (File Transfer Protocol) services are in place now or soon will be on all the major services.

Competition is mounting from the smaller services as well. Smaller services are aggressively staking out claims to niche parts of the on-line world: Delphi for easy and complete Internet access,

HIGHLIGHTS

On-Line Services

ALL THE WORLD'S ON-LINE, or at least it seems that way. The major on-line players have more users, and are delivering expanded services in glossier and easier-to-use packages. With new tools and information available, there are more reasons than ever to log on, especially with the scheduled launch of two next-generation services this year, The Microsoft Network and Interchange.

THE SERVICES' CONTENT is why you're on-line, and while you'll see similar kinds of information on different services, quality and timeliness vary. Content is more than news and information: discussion forums, software forums, support, travel and shopping services, and entertainment all make up your on-line experience. You'll want to choose the service that provides the content you need.

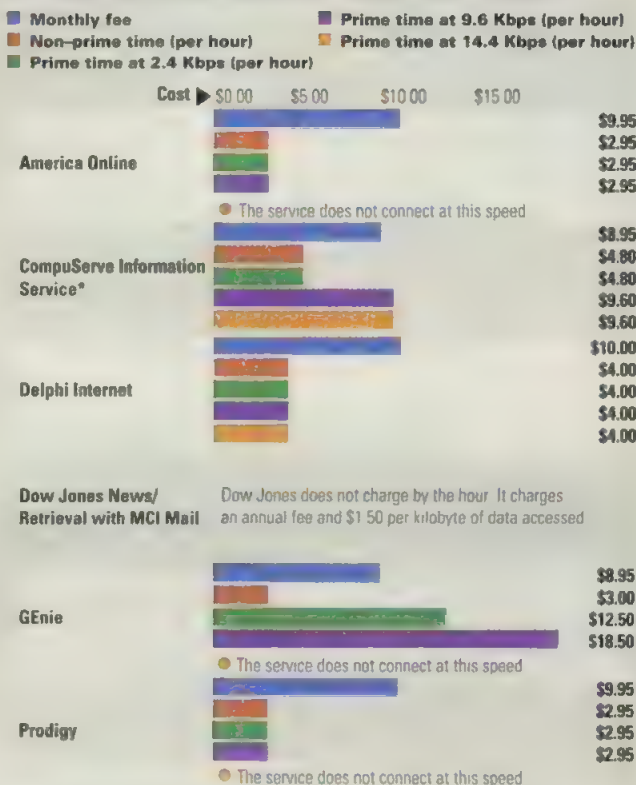
BETTER GRAPHICAL INTERFACES help you navigate more easily on-line, and perhaps more importantly, use the information off-line. All the services have polished their GUIs: America Online and GEnie have new Windows front ends, and Prodigy should release its new Windows interface shortly. Even Internet access providers, such as The Pipeline and NETCOM, offer graphical tools as part of their service.

COST IS CONTINGENT on several factors, but most services charge a basic rate per hour of connect time. Other than a flat monthly fee, you pay for the time you are connected. (Dow Jones's pricing structure charges per kilobyte; see the chart on the right.) Surcharges can work into the equation for prime-time access, modem speed, and how you connect—whether via a local number, an 800 number, or a third-party network. This year, as more services enter the on-line market, you should see prices drop considerably.

INTERNET CONNECTIVITY has extended the reach of commercial on-line services beyond e-mail. But if you want a complete Internet connection, you're still better off with a local access provider.

Rate Basics

America Online, CompuServe, and Prodigy charge similar rates. Most services charge a monthly fee that includes 4 or 5 hours of connect time. Some charge extra for higher-speed access.



and GENie for a new generation of games players who also need their business research. Dow Jones, meanwhile, continues to target and corner the higher-end business user market.

Don't look now, but what used to be local Internet service providers are making the push to the national and international level, and in the process are taking direct aim at the big commercial services. The Pipeline, NetCom, and a handful of others are every bit as robust as the large commercial services and can typically cost much less. We've taken a healthy look at a sampling of these providers (see the sidebar "Routes to the Net").

PAGE YOURSELF (OR BRACE YOURSELF)

While changes in content and user interface are certainly welcome, the pace of change makes choosing an on-line service daunting. It's tough enough to choose between AT&T, Sprint, and MCI as phone carriers when all you have to do is compare price and access. Imagine if you had to compare content too! That's the challenge of evaluating on-line services. Here's a simple three-part checklist to help you find the on-line service that's best for you:

- best interface;
- best content;
- best price.

Of course these parts have to be jugged until you to get the best personal balance for you. User interface, for example, has a good deal to do with how you prefer to work. Do you want to view the entirety of cyberspace, or would you rather have a somewhat tailored and organized view of things? Do you prefer to navigate through the on-line services interactively, always connected, or do you want to batch up information, download it, and read it off-line?

When it comes to how you pay for your on-line access, do you want to pay a flat fee for unlimited access or be charged only for



For business users:

• CompuServe/Information Services

For home users:

• America Online

By all means get on-line. But choose your on-line service carefully, because what you are choosing is not just how to spend your money—in itself, not a

decision to be made without care—but also where and how to spend your on-line time. If you want to use one on-line service for general access, you'll probably want to choose from the big three: America Online, CompuServe, and Prodigy. These offer the best balance of rich content, a usable interface, and affordability. Still, choosing is no easy matter.

CompuServe is our choice for business users. It is the oldest service, the most mature of the big three, and still unrivaled when you judge solely on the breadth and depth of content. When we say content we mean *all* content—from reference databases to forum discussion groups to files for downloading.

CompuServe has long attracted serious business users. When you add to that the download libraries, the best interface to discussion groups, and discussions with the richest content, you have a winner.

America Online (AOL), our choice for home users, is the fastest-growing of the three services. It's easy to see

why: To put it bluntly, AOL has the coolest interface and has had for some time. The new software (Version 2.0) will expand a well-deserved reputation for ease of use. And it's gaining new content providers almost as fast as users. AOL has been grooming all parts of its service. Its e-mail is the easiest to use, and its Internet connectivity is second only to Delphi's. Installation is a snap.

Prodigy may be the last in this group, but it is a select group. Prodigy is in the process of a complete overhaul, from its user interface to the back-end publishing platform. And from our early looks, it's impressive. Add to that Prodigy's claim that it will be the first of the big three to expand its Internet connection to include a graphical World-Wide Web browser.

You'll have a hard time choosing another service on the basis of range of content, but you can justify another based on cost or focused content. If it's the Internet you're after, consider a local Internet provider.

the time you use the service? Do you want focused content, highly technical content, or general news-oriented content? These are but a few of the questions you'll need to ask yourself as you read these reviews.

CONTENT, CONTENT, CONTENT

Our testing this year focused heavily on content. We evaluated not only the type and the quantity of various services on each service provider but the quality, too. Content includes vast territories of information: discussion groups or forums, databases for reference, news

feeds, interest and hobby groups, and file download areas. But there are ways to differentiate. Our ratings take into account the breadth and depth of the information, its accuracy, timeliness, and the quality of its participants (in the case of forums).

We divided content into three areas: business, reference, and leisure. We broke those big categories down further into investing and finance, computer hardware and software support, travel, on-line reference material, business and career, news and weather, on-line shopping, health, sports, hobbies and leisure,

FEATURES PLUS

February 13 to 17: Discuss on-line issues on-line with PC Magazine editors and reps of the services discussed here. Type GO EXEC from any CompuServe! prompt.

How To ECONOMIZE (CALL COMPAQ D



Compaq Contura® Aero™

\$1,199

Or \$43
per month*

Weighing in at a mere 3.5 lbs., the Contura Aero makes the perfect traveling companion. Though lightweight, it's packed with features you'd never expect in a PC this small, including a 486 processor, a PCMCIA Type II slot, and an integrated trackball.

Aero Features:

Only 3.5 lbs. and 10.25" x 7.5" x 1.5"
♦
486SX/25 Processor
♦
4MB RAM (expandable to 12MB)
♦
170MB Hard Drive
♦
3.5" External Diskette Drive
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8" Monochrome Backlit VGA Display
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Integrated Compaq EasyPoint™ Trackball
♦
PCMCIA Type II slot
♦
NiMH Battery & AC Adapter
♦
Preinstalled MS-DOS® 6,
MS-Windows™ 3.1, and TabWorks®



Compaq Contura® 400C

\$2,499

Or \$89
per month*

The new Compaq Contura 400C is an affordable, lightweight color notebook with such practical features as an integrated centered trackball, wall-mount AC adapter, tilting full-function keyboard, PCMCIA slots and a clip-on carrying handle.

Contura 400C Features:

486DX2/40 Processor
♦
4MB RAM (expandable to 20MB)
♦
250MB Hard Drive
♦
Two PCMCIA Type II slots (or one Type III)
♦
3.5" 1.44MB Diskette Drive
♦
9.5" Color Dual Scan Display
(8.4" Color TFT available, shown above)
♦
Integrated Trackball
♦
Only 5.9 lbs.
♦
Preinstalled MS-DOS 6,
MS-Windows 3.1, TabWorks,
and Lotus Organizer



Compaq LTE Elite™ 4/40CX

\$3,279

Or \$116
per month*

Our new high-performance notebook is equally at home on the road or on your desk, especially with the optional SmartStation.™ The AC adapter is built-in to reduce carrying weight. You have your choice of displays, removable hard drives, and processors.

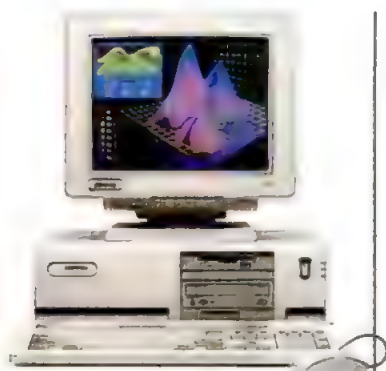
LTE Elite Features:

486DX2/40 Processor
(other models available)
♦
4MB RAM (expandable to 20MB)
♦
170MB Removable Hard Drive (340MB available)
♦
Two PCMCIA Type II slots (or one Type III)
♦
3.5" 1.44MB Diskette Drive
♦
8.4" Color VGA TFT Display
♦
Local Bus Graphics
♦
Built-in AC Adapter and Trackball
♦
Preinstalled MS-DOS 6,
MS-Windows 3.1, TabWorks, and
Microsoft® Video for Windows (Runtime)

*Leasing is provided by GE Capital Services for a term of 36 months and is subject to approved credit and certain terms and conditions. Call for details.
†Restrictions and exclusions apply. Monitors, battery packs and certain options are covered by a One Year Warranty. Compaq Contura Aero, Contura 400, and LTE Elite are covered by a 3 Year Pick Up Warranty. ©1995 Compaq Computer Corporation. All rights reserved. Compaq and the Compaq Logo are registered U.S. Patent and Trademark Office. Contura and Deskpro are registered trademarks; DirectPlus is a registered service mark, and Aero, QVision, Vocalyst, SmartStation, LTE Elite, ProLinea and EasyPoint are trademarks of Compaq Computer Corporation. Products, prices and programs are subject to change without notice. Other products are trademarks or registered trademarks of their respective companies. Microsoft and MS-DOS are registered trademarks, and Windows is a trademark of Microsoft Corporation. TabWorks is a registered trademark of Xerox Corporation. Pentium is a trademark of Intel Corporation. Offer available in the U.S. only.

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Compaq Deskpro® XL 560

\$3,599

*Or \$127
per month**

Introducing a new level of performance and flexibility. With both PCI and EISA slots plus integrated 32-bit PCI Ethernet and Fast SCSI-2. Configures as either a desktop or tower.

Deskpro XL Features:

Intel Pentium™ 60MHz Processor
(other models available)
♦
8MB RAM (expandable to 136MB)
♦
535MB SCSI Hard Drive
♦
3.5" 1.44MB Diskette Drive
♦
QVision™ PCI Local Bus Graphics with 2MB VRAM
♦
Compaq 151 FS Color Monitor
(1024 x 768, NI)
♦
Vocalyst™ Keyboard
♦
Ethernet and SCSI-2 Controller
♦
Preinstalled MS-DOS 6, MS-Windows 3.1,
TabWorks, and Network Interface Drivers



Compaq ProLinea™ 4/66

ProLinea 4/66 Features:

486DX2/66 Processor
(upgradable to Intel Pentium technology)
♦
4MB RAM (expandable to 100MB)
♦
270MB Hard Drive
♦
3.5" 1.44MB Diskette Drive
♦
Local Bus Graphics
♦
1MB Video Memory
♦
Compaq SVGA Color Monitor
(1024 x 768)
♦
Energy Star Compliant
♦
Preinstalled MS-DOS 6,
MS-Windows 3.1, and TabWorks

Our popular ProLinea **\$1,699**
series offers *Or \$60 per month**

you great performance, including faster local bus video, Intel Pentium OverDrive upgradability, and an optional secondary cache. Affordable, expandable and loaded with features, the ProLinea gives you everything you need for a variety of business applications.

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Weekdays 7-7, Sat. 10-4 CST

Ask for our new free catalog.

and games. Our "Quick Take on Content" may give you the most important piece of information you need when purchasing your service.

E-MAIL CONNECTIONS

Right up there with content is the e-mail capabilities of these services. Most of them have really beefed up their e-mail services with the ability to add multiple file attachments to a message, send messages to lists of people, find other users quickly on the service, chat interactively in real time, and organize messages into reasonable archives.

Also important is the ability to send

mail to other users who happen to subscribe to a different mail service. While AOL and Prodigy are the easiest to use, CompuServe has the richest feature set and largest user community.

CHARTING A PROPER COURSE

Someday our computers may be so smart that they will anticipate what we want to do on-line. Using intelligent agents, our computers will connect, update our data views, and inform us when the data we are waiting for has arrived. Today we still have to do all that ourselves, which is why ease of navigation is an important—sometimes the most im-

portant—feature of an on-line service.

All of these services are easier to use than they were a year ago. Every service has upgraded its own front-end software, so have third-party providers (for a look at your front-end options, see the sidebar "A Change of Face").

If we were designing our perfect front-end program, it would let us pick our most-often-used locations from provided menus, allow us to customize quick access routes, and let us backtrack to recently visited places. We'd want macros for automating the complicated tasks we do on a regular basis, and information organized in a way that makes

■ Seven Ways to Save Time and Money On-Line

By Todd Spangler

Some of the on-line services in our main roundup include time and services in their basic packages. But at some point, you'll start paying extra for time you spend connected and data you access or download. Costs can also add up depending on when you connect and at what speed.

You can help yourself out. Here are some tips for spending your time on-line wisely. We've also included a cost chart for a typical session under each service above the standard charges.

- **Keep track of monthly usage by the hour.** If you're not a daily user, you may not even use all the hours included in the basic monthly price.

Most front-end software lets you time hours on-line.

- **Use off-line navigation software.** Compose messages off-line with software that lets you

send and receive messages all at once. Some software even lets you download entire discussion threads and read them when disconnected.

Also, some packages let you "script" your on-line session to perform tasks and get information quickly and efficiently. (See the sidebar "A Change of Face" for a roundup of some of these front ends.)

- **Be aware of what services cost on-line.** Costs will include surcharges depending on modem speed, time of day, and method of access. Being aware of the best way to log on could save you lots of cash. Using services during off hours may also

save you money. Consider alternative pricing plans if they're available: If you're only sending e-mail to Aunt Mabel, you may want to switch to CompuServe's alternative pricing plan of \$2.95 per month (rather than \$8.95 per month). Or switch to an e-mail-only service.

- **Watch large downloads.** Long downloads are not only expensive, they tie up your system. Also, you will be charged not only for the connect time, but possibly by the service or application vendor for the privilege as well.

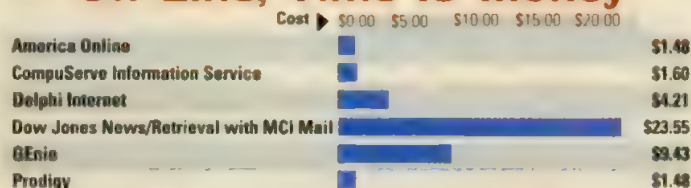
- **Be willing to search occasionally.** The information you want may be available less expensively on another service or free via the Internet. (See our table and sidebar on Internet information sources for more information.)

- **Think globally, act locally.** Find the best local number to access your far-reaching service. You don't want to pay long-distance

charges on top of connect fees. If you access the service via an 800 number or a third party such as SprintNet, extra charges could apply. With an Internet connection, a service provider in your area code is a lot cheaper than national or international service.

- **Have an on-line strategy.** Unless you're just getting your feet wet, it helps to know exactly where to go on the service to get information immediately. Many have directories or indexes; you may want to print them out so you have a list of the keywords, jumpwords, and gowords close at hand.□

On-Line, Time Is Money



Here's a look at how on-line costs compare—beyond the monthly fees, which can include free hours. We simulated a half-hour session of tasks representing what a user might do on-line daily. Our tasks included sending three e-mail messages (1K each), checking four stock quotes, retrieving four business summaries, checking airline flight availability, and accessing a forum and posting a message there. We made each call at 9:00 A.M. on a weekday and connected at 9.6 Kbps.

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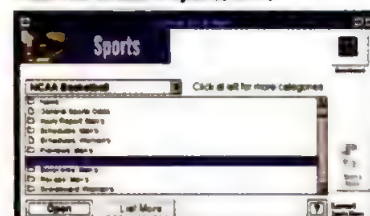
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Quick Take on Content

America Online's sports wire



Investing and Finance

America Online

Fair
AOL provides basic stock quotes and market tracking but lacks any in-depth financial-research tools.

CompuServe

Good
CompuServe has everything from basic stock quotes and Standard & Poor's to an on-line discount broker.

Computer and Software Support

Fair
Major vendors are present. Some have good software updates and information; others are much weaker.

Excellent
If a vendor provides on-line support, chances are you'll find it here. Most use the forums to offer updates.

Travel

Good
Book a reservation anywhere. There's a lot of background material to help you choose a destination, too.

Excellent
International flavor abounds. Choose from three on-line travel systems to book reservations.

On-line Reference Materials

Good
AOL has sections for popular magazines and TV networks, as well as Compton's Encyclopedia.

Excellent
A wealth of resources, including Grolier's Encyclopedia and Peterson's College Database.

Business and Career

Good
AOL offers a wealth of current nationwide classified ads, but no business-research materials.

Good
Numerous career forums and excellent research support, but on-line classifieds aren't as helpful.

News and Weather

Excellent
With Reuters, UPI, and several other news services, AOL gives you the news you need when you need it.

Excellent
A superb selection of up-to-the-minute reports from the AP, Reuters, and other international wire services.

On-line Shopping

Fair
This section features numerous places to look for items, but some are merely pointers to mail-order houses.

Fair
Plenty of places to look but few visuals or descriptions. Often there's no advantage to ordering on-line.

Health

Good
AOL's many health-related forums and services include the participation of a few major health organizations.

Good
Health-related reference materials abound and include a drug database and a section on AIDS information.

Sports

Good
Sports news and scores are an AOL strong point. Highlights in most sports offer more than just updates.

Good
Sports updates may not be play-by-play, but AP Online and AP Sports Wire provide timely scores.

Hobbies and Leisure

Good
Many hobby and leisure forums are available, although AOL doesn't seem to cover a range of interests.

Excellent
CompuServe offers a range of forums for virtually all flavors of hobby and leisure activities.

Games

Good
Not many games, but the quality of those offered is high. Sections include vendor-supported forums.

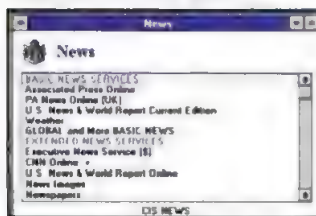
Excellent
Good multiplayer games and plenty of shareware in active forums that include vendor support.



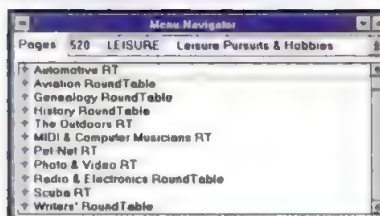
NETWORKING

On-Line Services

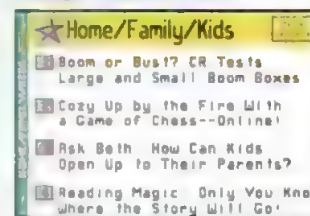
CompuServe's news menu



GEnie's hobbies roundtables



Prodigy's family forum



Delphi

Dow Jones

GEnie

Prodigy

Fair

Delphi offers stock quotes that are updated about every 20 minutes, but it does not let you purchase stocks.

Excellent

In a class by itself, Dow Jones offers unequaled coverage of financial markets and analyst information.

Excellent

Exclusive information from TRW and Dun & Bradstreet and access to Charles Schwab and Dow Jones.

Good

Prodigy provides 15-minute-delay stock quotes and includes financial advisors in on-line discussions.

Good

Delphi has no vendor forums but offers custom forums run by users well versed in particular products.

N/A

N/A

Fair

The major software vendors are present on GEnie, but there are fewer hardware and smaller-size vendors.

Fair

Information is not updated often, and don't expect to find a patch here for OS/2 Warp.

Good

Delphi offers Eaasy Sabre, OAG, and Travelshopper. Though informative, OAG is expensive.

Fair

OAG travel has a reservation section, but the lack of any forums or databases leaves you empty-handed.

Good

GEnie provides access to Eaasy Sabre and OAG. Travel forums are good but not in-depth.

Good

Prodigy offers Eaasy Sabre, plus several great travel guides, including restaurant reviews.

Good

Delphi offers—through its own news-group and the Internet gopher—a vast amount of reference information.

Excellent

With more than 1,800 on-line publications, Dow Jones makes up for offering only one encyclopedia.

Excellent

Possibly the richest source for on-line research, with Dialog, Dow Jones, and Dun & Bradstreet databases.

Good

Most areas are up to date, and on forums you can discuss the content of reference materials with authors.

Fair

Several forums dedicated to business and career opportunities. Members can start their own forums.

Good

Dow Jones offers an informative careers section, with job postings and good advice for the professional.

Excellent

Users can access job-search services and round-table discussions about careers.

Fair

Even though this area is updated daily, the information is not especially helpful.

Excellent

In addition to news from UPI and Reuters, Internet gopher connects you to servers around the world.

Excellent

With the most newspapers on-line and six news wires, the best for national, business, and company news.

Excellent

GEnie provides news through Reuters, Newsbytes, Dow Jones, and GEnie Newsstand.

Good

Prodigy boasts up-to-the-minute news and weather, but its efforts to edit items over-simplify content.

Good

Delphi offers many easy ways, including games, to get to the World-Wide Web for shopping sprees.

Fair

A small selection and sparse product information; you'd be better off shopping elsewhere.

Good

You can shop through the GEnie mall's 40 or so stores.

Excellent

Prodigy is an electronic shopping mall. You can even talk to the Home Shopping Network.

Fair

Delphi's health forums are run by independent groups.

Good

Dow Jones publishes health-care industry press releases daily and offers a dozen health publications.

Fair

GEnie does not spend a lot of time on health-related issues.

Excellent

Prodigy offers diet information and discussions with nurses, dietitians, and doctors.

Good

Delphi has several sports forums, as well as an Internet gopher to other sites.

Fair

About all you'll get here is last night's scores. There is no in-depth commentary or discussion forums.

Good

Sports information is provided by the sports network on GEnie and is augmented by news feeds.

Excellent

Prodigy's immediate sports comes from ESPN. Talk to sports personalities and participate in polls.

Good

Because forums are maintained by enthusiasts, you'll find unique and helpful hobby and leisure forums.

Poor

It provides some expensive book and movie reviews, but Dow Jones is dedicated to business, not leisure.

Good

With 80 areas devoted to hobby and leisure, GEnie provides forums bested only by CompuServe's.

Good

Prodigy offers good entertainment coverage and educational services that will engage your children.

Good

Single- and multiplayer games and an Internet gopher that takes you into related materials.

N/A

N/A

Good

The selection of games is not huge, but GEnie offers entertaining games for both single and multiple players.

Good

Excellent children's games. Although some games are old, there are many to choose from.

Internet Trail Guide

By Thomas W. Giebel

In some ways, the Internet is the ultimate on-line service—but only if you know where to look. To help point you toward the unbelievable amount of information that's out there, we've assembled this list of Internet directories to help you out.

Many directories are maintained by watchful list-keepers who check every item. Some are created by automated agents who systematically walk the Web in search of new resources or solicit information from Internet users. You will find some redundancy when searching more than one site, but this is still more efficient than relying on a serendipitous surf. You'll save time and find more information.

A word about information gathered from the Internet: Many offerings are semiofficial or experimental, offering no guarantee of accuracy or completeness. You'll probably want to research the origins of a database before staking your job on it.

GENERAL-INFORMATION CLEARINGHOUSES

The WWW Virtual Library

(<http://info.cern.ch/hypertext/Data-Sources/bySubject/Overview.html>) from CERN offers topical and geographic indexes to Web sites. The WWW Virtual Library is a distributed catalog; different topics are maintained by different sites.

The WWW—World-Wide Web

Worm (<http://www.cs.colorado.edu/home/mcbryan/WWW.html>) is an automated system that scans the Web and creates a searchable catalog.

The CUI W3 Catalog

(http://cui_www.unige.ch/w3catalog) from the University of Geneva offers a searchable interface to several manually maintained Internet catalogs.

Solinet (gopher://sol1.solinet.net) features assembled pointers to a nice collection of on-line ready-reference tools such as directories, dictionaries, thesauri, and library catalogs.

The Online Whole Internet Catalog

(<http://nearnet.gnn.com/gnn/wic/index.html>) is a hypertext version of the resource guide from the Whole Internet Catalog from O'Reilly & Associates.

Many offerings are semi-official or experimental.

You'll probably want to search the origins of a database before you stake your job on it.

The Internet Town Hall

(<http://town.hall.org/>), a service of the Internet Multicasting Service, is a good starting point to access a variety of Internet-based information.

Harvest (<http://town.hall.org/brokers/Home.html>), sponsored by the Internet Research Task Force on Resource Discovery, is an ambitious project to gather and organize information about the Internet. You can perform a WAIS search of Harvest brokers, computer-science technical reports, and Web pages—all from this site.

The Web at Nexor

(<http://web.nexor.co.uk/public/welcome.html>) offers a variety of Internet directories. You can perform keyword searches in the CUSI and ALIWEB databases, and search for

files on anonymous FTP sites using ArchiePlex.

The Clearinghouse for Subject-Oriented Internet Resource Guides

(<http://http2.sils.umich.edu/lou/chhome.html>), a joint effort of the University of Michigan's University Library and School of Information and Library Studies, offers a searchable database of subject guides available on the Internet.

Galaxy

(<http://www.einet.net/galaxy.html>) from EINet is another exhaustive directory of Internet resources, organized by subject and fully searchable.

The Mother-of-all-BBS

(http://www.cs.colorado.edu/homes/mcbryan/public_html/bb/summary.html) is a subject-oriented directory of Web pages. The Mother-of-all-BBS service solicits information about new Internet sites from users.

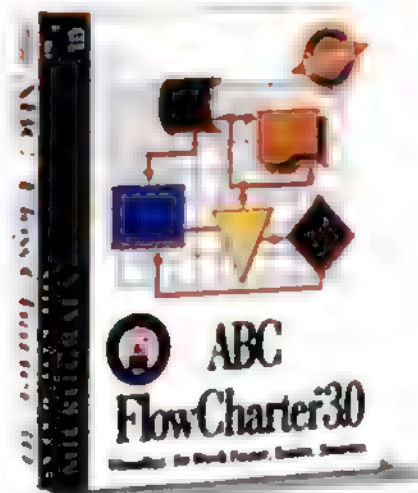
U.S. GOVERNMENT SITES

The U.S. government is one of the most prolific providers of information on the Internet. The following sites link to a wealth of information from or about the federal government.

- **FedWorld** (<http://www.fedworld.gov>)
- **Government Information Locator Service (GILS)** (<http://info.er.usgs.gov/gils/index.html>)
- **White House: An Interactive Citizens' Handbook** (<http://www.whitehouse.gov>)
- **Library of Congress** (<http://marvel.loc.gov>)

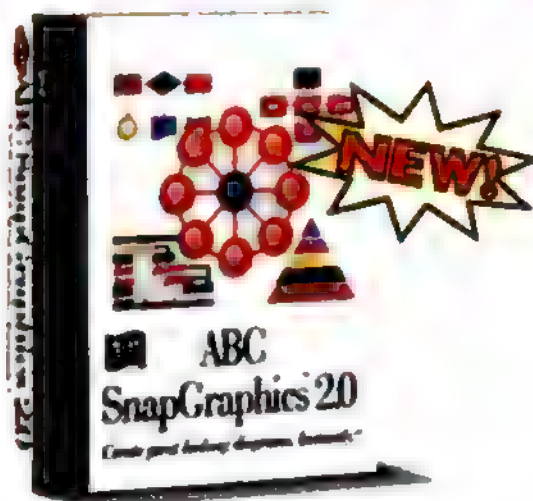
A hypertext version of this sidebar is available from PC Magazine's Web server and can be accessed at <http://www.pcmag.ziff.com/~pcmag>. □

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CIRCLE 361 ON READER SERVICE CARD

Suitability to Task: On-Line Services

These on-line services are windows into exciting areas of useful information and services. We evaluated not only the windows, but the nature of the views from those windows. It's clear that to choose the right service, you must take into account all of the variables. Your challenge is to select an on-line service that provides the right content, connectivity, and interface for you.

Under **installation and orientation**, we examine what it takes to go from the initial whim of wanting an on-line service to making your first connection. We note whether the service lets you try it before joining. We also note the availability of local- and toll-free-access phone numbers. Finally, we evaluate the Windows-based software installation and modem setup.

The breadth and depth of available **content** areas is central, so we did an exhaustive evaluation of 11

content areas and give an overall rating here. (Individual ratings for each area can be found in the table "Quick Take on Content.") Ratings take into account how often information is updated and the quality and diversity of the information.

A clear **interface** into the myriad information areas can be as important as the information itself. We note whether the interface is graphical or text-based. Ease of navigation and effectiveness of search mechanisms is important. And we observe whether graphical menus are used throughout the many layers of the service, or whether they are simply inroads to text-based character screens.

The **e-mail** portion of a package should be easy to use and offer paths to as many other mail services as possible. We look for the abilities to attach multiple text and binary files, as well as multimedia elements, to messages; request receipts; and designate Urgent notices. An easy-to-use address book is a definite plus.

some tips for battling the clock and related fees (see the sidebar "Seven Ways to Save Time and Money On-Line").

Another way to work inexpensively is to bypass the big commercial services and opt for a smaller Internet service provider. These regionally based services vary in ease of use but tend to be less expensive. But because they are regional, the smaller providers aren't for everyone. Travelers need large, on-line providers with a national presence and many access numbers.

To get an idea of how the Internet stacks up against commercial on-line services, see "Making the Internet Connection" in our October 11, 1994, issue. Also see our evaluation of a sample of Internet service providers in our sidebar here.

Our Contributors: RICK AYRE is an executive editor and ROBIN RASKIN is editor at *PC Magazine*. SEAN GONZALEZ is a systems support programmer at Ziff Information Services. PADRAIC BOYLE is a frequent contributor to *PC Magazine*. MICHAEL RYAN and LESLIE WYGANT are staff editors, AMARENDRA SINGH is a project leader, MELISSA PERENSON is an editorial assistant, FRANK J. DERFLER, JR. is senior networking editor, BILL HOWARD is an executive editor, and TODD SPANGLER and CADE METZ are editorial researchers. TIM M. CRAWFORD and JOHN GARRIS are technical analysts, and THOMAS W. GIEBEL is the librarian at *PC Magazine*. RUSS IWANCHUK is a support technician at ZD Labs. GAIL SHAFFER was the associate editor in charge of this story and ROBERT P. LIPSCHUTZ was the project leader.

We also compare the costs associated with sending e-mail outside the service, such as via fax or the Internet.

Under **discussion groups and forums**, we examine the scope of the discussions and the level of seriousness of the participants. We note whether both professional and leisure subjects are included. We look for a lot of daily and weekly activity regarding a given subject. We take into account the fact that an active sysop or expert on-line can improve most discussion groups. We also look for privacy options and whether there are on-line chat forums.

For good **Internet connectivity**, transparency is key. We also note the inclusion of methods for accessing Internet services—such as FTP, gopher, newsgroups, telnet, and the World-Wide Web. We evaluate the depth of connectivity and determine whether the service provides only a few FTP sites or access to the entire Internet. We also consider whether the service charges extra for connecting to the Internet.

SUITABILITY TO TASK	
Installation and orientation	POOR
Content	FAIR
Interface	GOOD
E-mail	EXCELLENT
Discussion groups and forums	EXCELLENT
Internet connectivity	EXCELLENT

ON-LINE PROBLEMS AND PROSPECTS

Those who read the general press and watch the news have heard an earful about the darker side of on-line: scams, porn, fraud, breaches of security, flammers, and all that other juicy stuff that makes for quick headlines. Certainly there are reasons to be wary. Two prominent concerns are information pollution and security.

Information pollution does not refer to the huge amount of information available but to the accuracy of the information. The on-line world currently has few checks and balances on the quality of the data it breeds. The democratization of information that comes with the on-line world means that anyone can become an instant authority. Some of the commercial services offer more in the way of "authority figures" than the Internet does. For example, on commercial services, topics like finances and travel are written, edited, and managed by experts in the field rather than being open free-for-alls.

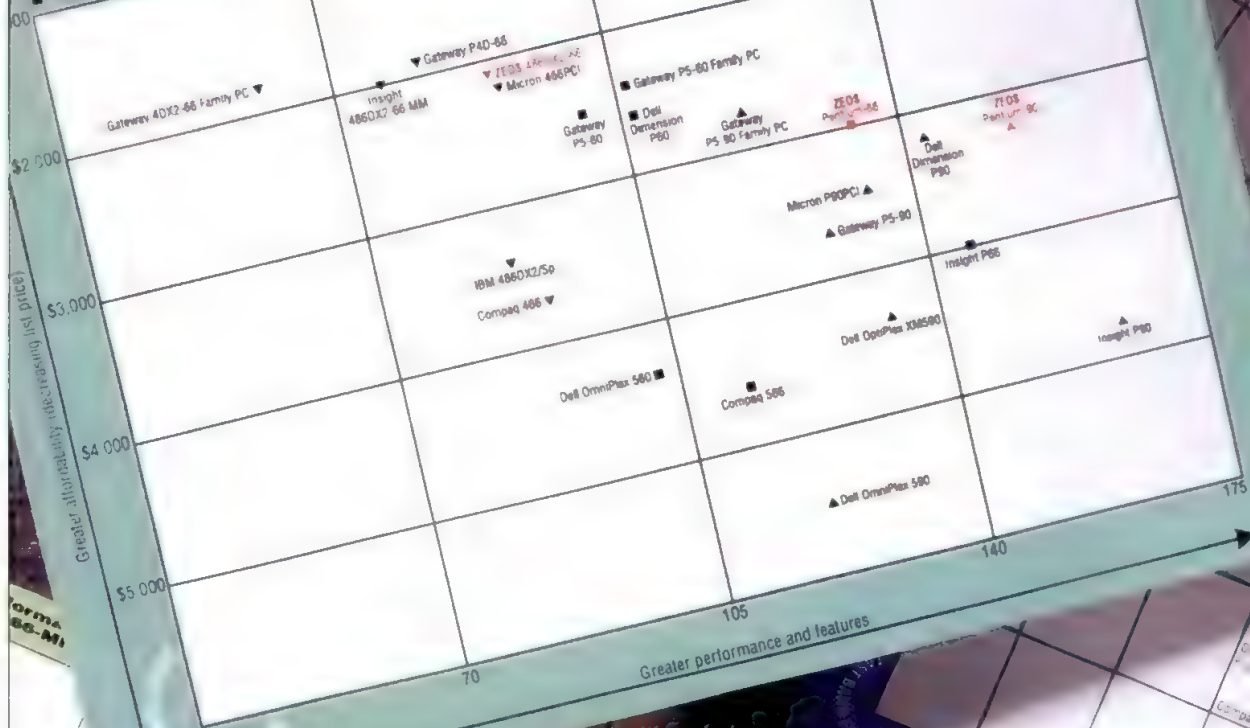
Depending on what you are doing on-line, se-

PAYING THE PIPER

Ah for a simple way of figuring out which service costs the most money! The pricing plans for on-line services can be almost as baffling as a mortgage application. To help you get a handle on costs, we've delineated the fee structure for each service and have priced sample sessions. We also have

Charting A New Course In Personal Computing.

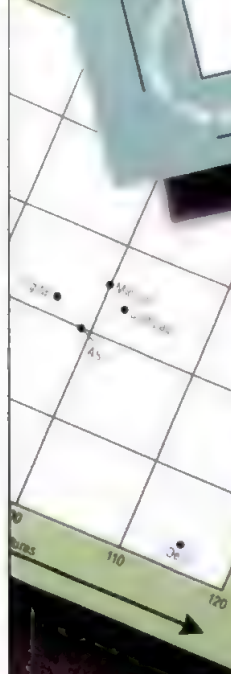
**Price/Performance Index:
Pentium and 486 PCs**



**Price/Performance Index:
90-MHz Pentium PCs**

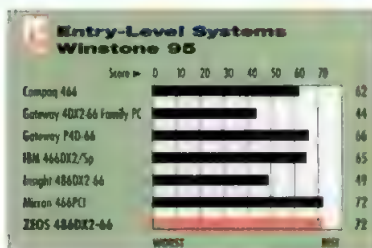
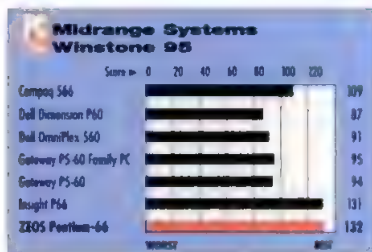
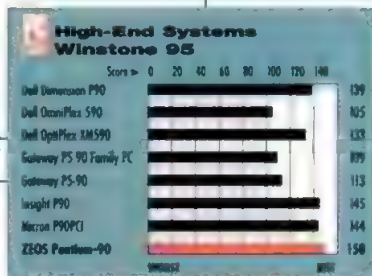
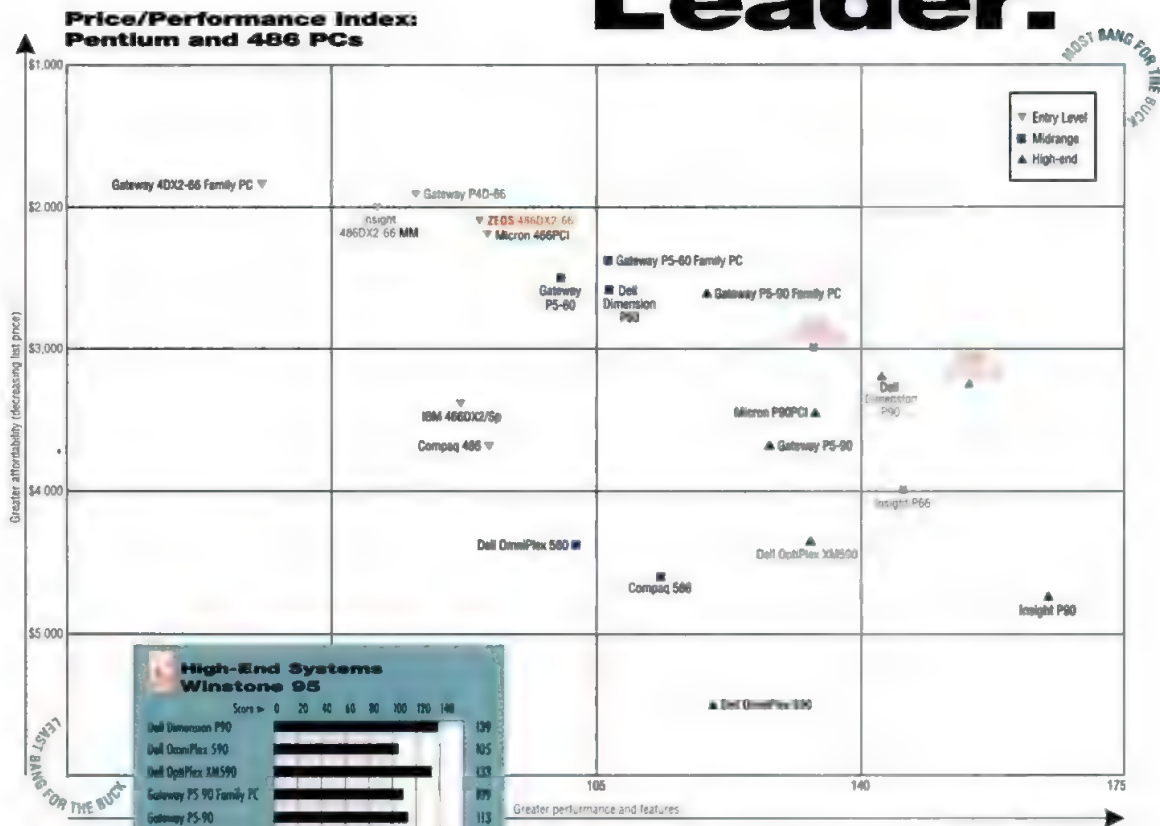


**Price/Performance Index:
66-MHz PCs**





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—PC Magazine, December 6, 1994

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486DX2-66 \$1445	486DX2-66 \$1745	486DX2-66 \$2245	486DX2-66 \$2645
DX4-100 \$1795	DX4-100 \$2095	DX4-100 \$2595	DX4-100 \$2995
Pentium-60 \$1795	Pentium-60 \$2095	Pentium-60 \$2595	Pentium-60 \$2995
Pentium-66 \$1945	Pentium-66 \$2245	Pentium-66 \$2745	Pentium-66 \$3145
Pentium-90 \$2095	Pentium-90 \$2395	Pentium-90 \$2895	Pentium-90 \$3295
Pentium-100 \$2495	Pentium-100 \$2795	Pentium-100 \$3295	Pentium-100 \$3695

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- ZEOS 14" 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch
- Six-bay desktop case with two cooling fans
- Microsoft Mouse
- MS-DOS 6.2, Windows for Workgroups 3.11

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- 528MB local bus IDE hard drive with 256K cache
- **4X CD-ROM** drive and 3.5" 1.44MB floppy drive
- **Diamond Stealth 64-bit** PCI local bus SVGA color graphics card with 1MB DRAM
- ZEOS 14" 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch
- Six-bay desktop case with two cooling fans
- Microsoft Mouse
- MS-DOS 6.2, Windows for Workgroups 3.11

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- **4X CD-ROM** drive and 3.5" 1.44MB floppy drive
- **Diamond Stealth 64-bit** PCI local bus SVGA color graphics card with 1MB DRAM
- **ZEOS 15"** 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch
- Six-bay desktop case with two cooling fans
- Microsoft Mouse
- MS-DOS 6.2, Windows for Workgroups 3.11
- **Lotus SmartSuite**

- 24MB RAM
- 1GB local bus IDE hard drive with 256K cache
- **4X CD-ROM** drive and 3.5" 1.44MB floppy drive
- **Diamond Stealth 64-bit** PCI local bus SVGA color graphics card with 1MB DRAM
- **ZEOS 15"** 1024 x 768 non-interlaced SVGA color monitor, .28mm dot pitch
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10-Bay Vertical Case\$95

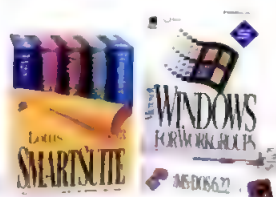
ZNYX EtherAction® 32
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80 to 250MB (with compression), includes backup software\$149

Multimedia Upgrade
Turtle Beach sound card and stereo speakers\$128

Many other affordable upgrades and options available. Call for details!

Free Lotus SmartSuite!



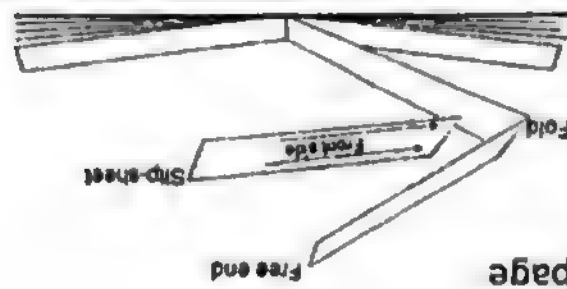
All Pantera packages include Microsoft DOS 6.2 and Windows for Workgroups 3.11. In addition, packages 3 and 4 include Lotus SmartSuite—1-2-3, Ami Pro, Freelance Graphics, Organizer and Approach.

800-554-7172

**24 Hours a Day
365 Days a Year**

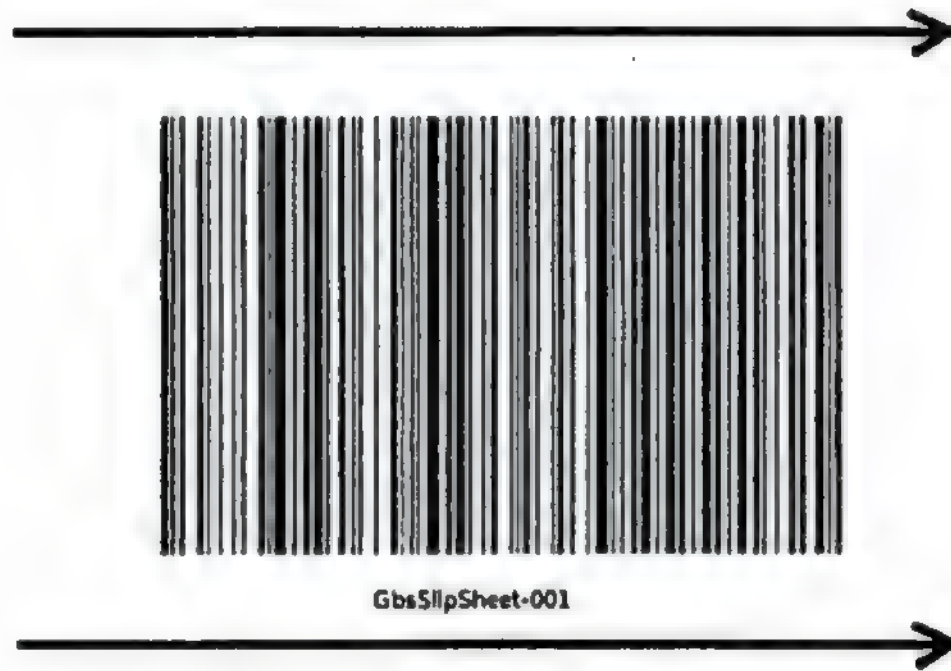


Fax Orders: 800-362-1205 or 612-362-1205. Phone Orders: Outside U.S. and Canada: 612-362-1212. Government: 800-245-2449. ZEOS Information Systems, Inc. GSA#GS00K94AGS5176.



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

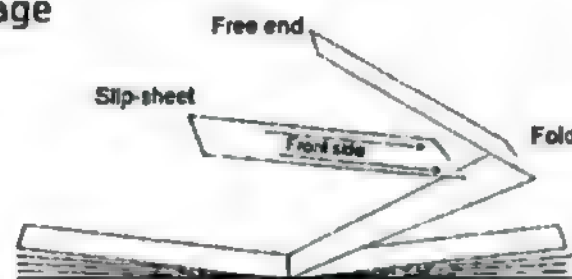
Inverted Foldout slip-sheet



Folded edge of the page

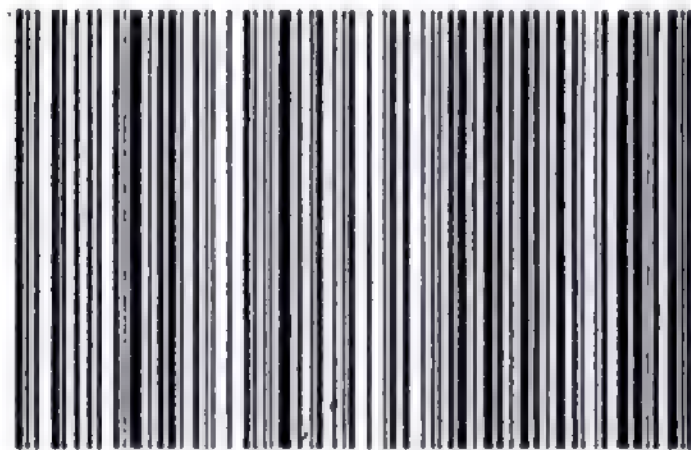
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlpBack-001B

Back

1. Follow instructions on the other side

ZEOS® Gives You The Biggest Bang For Your Buck.

Stealth 64-bit PCI video card with 1MB DRAM standard.

The results are unparalleled. "Mark a new high on the performance chart!"

PC World said the Pentium-66 and Pentium-90 Panthera PCs were "the

fastest system(s) ever tested." The Panthera DX4-100 earned four Best Buys and *PC World* said: "Top rated DX4-100 runs with the Pentium-90s but costs less." Also earning four awards, the Panthera Pentium-60 which was called the "fastest budget Best Buy."

The Panthera 66MHz and 90MHz received the highest scores in all benchmark tests run by *Windows Sources* too: "The clear winner is the ZEOS Panthera."

All Points Covered

The Panthera is a first-rate example of ZEOS' commitment to provide you with an excellent value on an award-winning machine that will increase your productivity. With all the extras, options, and 100% compatibility with all major operating systems, you can't go wrong.

Many of our most popular money-saving Panthera packages are ready to ship *the same day you order*. We also give you the option to custom-design a system to your exact computing needs.

Either way, you can buy with confidence because of our on-going dedication to provide you high-quality features and state-of-the-art technology at an affordable price.

And the value doesn't stop with your purchase.

PC World said: "ZEOS's nonstop toll-free technical support schedule is unbeatable." *PC Magazine* agrees.

In fact, ZEOS has won seven *PC Magazine* Readers' Choice for Service & Reliability awards.

Unequalled in performance, reliability and value, the ZEOS Panthera is the ultimate price/performance leader. To get the biggest bang for your buck, call your ZEOS Systems Consultant today at 800-554-7172.



Pentium-66
April 12, 1994
DX4-100
June 28, 1994



Pentium-60
April 1994
Pentium-60
August 1994



486DX2-66
January 1994
February 1994
March 1994
June 1994
December 1994
January 1995
February 1995
DX4-100
October 1994
November 1994
December 1994
January 1995
February 1995
Pentium-60
December 1994
January 1995
Pentium-66
June 1994
July 1994
August 1994
September 1994
Pentium-90
August 1994
September 1994
October 1994
November 1994
January 1995
February 1995



Pentium-66
May 1994



Pentium-66
June 1994
Pentium-90
August 1994



Pentium-90
November 1994



486DX2-66
March 1994

Time after time, the ZEOS Panthera has been tested against the competition, repeatedly beating all others hands down. In *PC Magazine's* price and performance comparisons of technologically-advanced systems from primary computer companies, ZEOS is once again the unbeatable value.

Unmatched in its success, the Panthera is earning award after award—month after month. To date, the Panthera has received an unparalleled 33 top honors from leading industry publications! Experts agree that the ZEOS Panthera provides you with the biggest bang for your buck.

PC Magazine reported: "Overall performance leaders... the Panthera line has a lot to offer—strong performance at a reasonable price, with excellent documentation."

As *Computer Shopper* said: "ZEOS set the standard."

Continuing with the ZEOS tradition of providing you with top performance, unwavering reliability and exceptional value, the ZEOS Panthera is charting a new course in personal computing for you.

Chart-Topping Performance

The Panthera—based on Intel's 486, DX4 and Pentium processors—is at the top of the performance charts, breaking records and beating all others. Why? Superior engineering built into each Panthera—beginning with a ZEOS-designed motherboard created specifically to take full advantage of the latest

technological advancements. The motherboard is stocked with exceptional features such as an on-board PCI Local Bus IDE Controller and support for up to four IDE devices. For the fastest video performance, every Panthera comes with a Diamond



ZEOS^{Can} Ship Today!

Our most popular packages can be shipped the day you call! Guaranteed!



486DX2-66 \$1745 Pentium-60 \$2095

Package #2:

- 8MB RAM
- 528MB local bus IDE hard drive
- 4X CD-ROM drive, 3.5" 1.44MB FDD
- Diamond Stealth 64-bit PCI local bus SVGA graphics card with 1MB DRAM
- 14" SVGA color monitor
- 6-bay desktop case
- MS-DOS, Windows for Workgroups, Microsoft Mouse



486DX2-66 \$2195

Top Gun:

The above system modified to include:

- 128K SRAM cache
- Diamond Stealth 64-bit PCI local bus graphics card with 2MB VRAM
- 15" SVGA color monitor upgrade
- 14.4/14.4 send/receive fax modem
- Lotus SmartSuite



Pentium-66 \$2845 Pentium-90 \$2995

Editors' Choice:

- 16MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive
- 4X CD-ROM drive, 3.5" 1.44MB FDD
- Diamond Stealth 64-bit PCI local bus graphics card with 2MB VRAM upgrade
- 15" SVGA color monitor
- 6-bay desktop case
- MS-DOS, Windows for Workgroups, Microsoft Mouse
- Lotus SmartSuite

Pentium-66 \$2995 Pentium-90 \$3195

Hottest Panthera:

- The above system modified to include:
- 1GB local bus IDE hard drive
- 6-bay desktop case (Pentium-66)
- 10-bay vertical case (Pentium-90)



Pentium-66 \$3318 Pentium-90 \$3468

Best MM:

- 16MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive
- 4X CD-ROM drive, 3.5" 1.44MB FDD
- 16-bit sound card, stereo speakers
- Diamond Stealth 64-bit PCI local bus graphics card with 2MB VRAM upgrade
- 17" SVGA color monitor
- 10-bay vertical case
- MS-DOS, Windows for Workgroups, Microsoft Mouse
- Lotus SmartSuite

Pentium-90 \$3895

Best MM Supreme:

- The above system modified to include:
- 24MB RAM
- 1GB local bus IDE hard drive
- Atec Lansing high-power speakers

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1 Choose the ZEOS system package you want.

(A sampling of our *Computers Now!* packages is shown at left.)

2 For same-day shipping, call ZEOS at 800-554-7172 before 1 p.m.

Central Time, Monday-Friday.

3 Upon credit approval, we'll ship your system the same day you order!

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If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it *at our expense* as soon as it is ready.*

Need A Bigger Monitor?

We can upgrade your *Computers Now!* desktop or vertical system with a larger monitor—and still ship it the same day you order!*



486DX2-66 \$1245

Package #1:

- 4MB RAM, 128K SRAM cache
- 340MB hard drive
- 3.5" 1.44MB floppy drive
- VESA local bus SVGA color video
- 14" SVGA color monitor
- 4-bay desktop case
- MS-DOS, Windows for Workgroups, Microsoft Mouse

DX4-100 \$2995

Package #3:

- 8MB RAM
- 350MB IDE hard drive
- External 3.5" 1.44MB floppy drive
- STN color VGA 7.9" display
- Custom carrying case
- Extra battery
- MS-DOS, Windows for Workgroups
- Lotus Organizer
- 7.8" x 10.2" x 1.7"; 3.9 lbs

DX4-100 \$3195

Package #3:

- 8MB RAM
- 350MB IDE hard drive
- Internal 3.5" 1.44MB floppy drive
- Dual-scan color VGA 10.3" display
- Custom carrying case
- Extra battery
- MS-DOS, Windows for Workgroups
- Lotus Organizer
- 8.9" x 11.7" x 1.9"; 6.3 lbs

800-554-7172

24 Hours a Day



Fax Orders: 800-362-1205 or 612-362-1205. Phone Orders: Outside U.S. and Canada: 612-362-1212, Government: 800-245-2449. ZEOS Information Systems, Inc. GSA# GS00K94AGS176. Purchase Orders, MasterCard, VISA, Am Ex, Discover, COD and affordable leasing programs. Open 24 Hours a Day, 365 Days a Year!

*When must be for Computers Now configurations, we're listed with a sampling here. Since we're constantly updating this list, if configurations, per package, order must be in on the list. This offer a good only as long as these pre-built systems remain in stock. Other ZEOS systems and custom configurations may take slightly longer, about a week. All orders are subject to credit approval. Monitor upgrades to higher resolution displays require new packages. Orders outside the continental U.S. may require additional shipping charges. Prices do not include shipping. World availability is dependent on local laws. Only "New" makes no warranties with respect to this product. For details and company policies, please refer to our computer products and services literature and the ZEOS International Ltd. website. ZEOS is a registered trademark. Computers Now! is a registered service mark. Panthera, Am Ex, Discover, COD and affordable leasing programs. Open 24 Hours a Day, 365 Days a Year! P/N 3/94/02/4

CIRCLE 155 ON READER SERVICE CARD.

curity may also be a concern. This will become more of an issue as on-line financial transactions and shopping become widely available. The legal ramifications of on-line correspondence are still being hashed out. If there is information that must be secure, there are ways to do it, such as encryption, but you need to make a conscious effort. Services like Prodigy talk about being more secure because they are tightly monitored, but each of the services requires awareness about the potential security threats.

We won't wax poetic about the newly forming electronic communities and the politics of being on-line, but we can assure you that the nature of business is changing, thanks to on-line services.

America Online Inc.



BY MICHAEL RYAN

Behind America Online's slick graphical interface is an on-line service that has a lot to boast about: a wide array of on-line resources, easy-to-use e-mail, a well-designed set of basic Internet tools, and simple installation. It's an especially good choice for home users, although it has the potential to be a lot more. People are noticing, too: AOL has grown from about 500,000 users to more than 1.25 million users in the past year.

AOL is one of the bargains here. Its basic rate is only \$9.95 per month, which includes 5 hours of on-line time, with very few additional charges (\$2.95 for each hour beyond 5 and some per-page charges for faxes and paper mail messages). And

in a structure that challenges CompuServe's, AOL's flat monthly rate also includes unlimited e-mail messaging and Internet services.

Getting up and running is a breeze. We installed the AOL Windows software (software is also available for DOS and



America Online's new interface makes navigation easy; nearly all of its features and content are accessible from a graphical menu.

the Macintosh) and were on-line in less than 10 minutes. Like Prodigy, AOL supports multiple aliases (or screen names)—in this case, up to five per account. This is a great feature for families.

The AOL interface, which was recently redesigned, is the best in the group. It's more graphical than ever and includes much-improved navigation tools. Nearly every feature is accessible through a graphical menu.

Similar ease of use extends to AOL's e-mail system. Although CompuServe offers the most completely integrated e-mail system in this roundup, AOL's is the most intuitive. You can send mail to AOL

users as well as to Internet users and members of other services that are accessible on the Internet. Unlike CompuServe, AOL requires no complicated treatment of Internet addresses. A customizable address book is available.

AOL currently offers the best Internet connectivity (beyond e-mail) of the group—with the exception of Delphi. AOL's Internet Connection provides access to FTP, gopher, Usenet Newsgroups, and WAIS databases. AOL has done a

tremendous job of incorporating FTP and gopher into the standard AOL interface, making these tools very user-friendly. Telnet and World-Wide Web services are planned for 1995.

In addition, AOL recently purchased three Internet software vendors—Advanced Network & Services, NaviSoft, and BookLink Technologies—to further expand its Internet offerings and presence.

All these access tools help you get at the considerable amount of content on AOL. Its numerous news services are kept current for the most part. Reuters provides the largest news coverage, although ABC, Time magazine, The New York Times, CNN, and UPI also maintain news services on AOL.

The quality and content of AOL's magazines vary widely.

Time puts most of its stories on-line every week and even offers hourly updates for major events. Consumer Reports posts a major story only every month or so.

For weather, AOL offers and con-

▶ FACT FILE

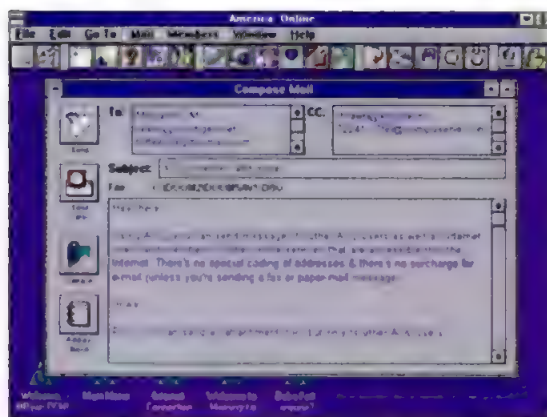
America Online

Requires: 386-based PC or better, 4MB RAM, VGA monitor, mouse, modem, Microsoft Windows 3.1 (for Windows version) **In short:** America Online is a well-designed, easy-to-use service that offers a great range of content and a very intuitive e-mail utility. AOL also includes well-implemented basic Internet services, and the company plans to expand its involvement with the Internet. It is a great choice for a home on-line service. Families will especially appreciate the fact that AOL lets you have multiple aliases—or screen names—which makes it possible to have up to five users per account. AOL includes some business resources that let you track financial news and stock prices and even make some purchases, but enhanced business services and faster access speeds would make it more attractive to the business user.

SUITABILITY TO TASK

Installation and orientation	EXCELLENT
Content	GOOD
Interface	EXCELLENT
E-mail	GOOD
Discussion groups and forums	GOOD
Internet connectivity	GOOD

America Online Inc.
8619 Westwood
Center Dr., Vienna,
VA 22182-2285, 800-
827-6364, 703-448-
8700, e-mail, post-
master@aol.com.
460 on reader service card



Using e-mail is a snap with America Online. You get an intuitive and easy-to-use system.

stantly updates plentiful five-day forecasts, colorful weather maps, and satellite images.

Many computer vendors also have homes on AOL, offering product information, software libraries, and well-monitored technical-support forums. Some vendors, such as Compaq Computer Corp., maintain rich, well-designed sections that provide a wealth of useful information. Others offer limited, text-only menus and slim, rarely updated software libraries.

AOL also includes some business resources, but not as many as CompuServe,

Dow Jones, and GENie. Still, you can track financial news and stock prices, and even make some purchases. For market novices, there's an on-line game called Bulls and Bears that lets you learn the ways of Wall Street by simulating stock trades with a fictional \$100,000 credit line.

If you add up all of AOL's content services and throw in its low cost, easy-to-use e-mail, and basic Internet connectivity, you end up with a solid on-line service that is perfect for home use. With some other features, it could become a lot more attractive to the business user as well.

CompuServe Inc.



EDITORS' CHOICE

**CompuServe
Information Service**

BY MELISSA PERENSON

An old star in the on-line universe, CompuServe Information Service continues to bring together a wide range of resources and services to address the needs of business and home users. Its news and financial information, research databases, and hundreds of discussion forums re-

On-Line Services: Cost Comparison

Services listed in alphabetical order

	America Online	CompuServe Information Service ①	Delphi Internet	Dow Jones News/ Retrieval with MCI Mail	GENie ②	Prodigy
Basic Services						
Monthly fee	\$9.95	\$8.95	\$10.00	None	\$8.95	\$9.95
Number of hours included per month	5	Unlimited	4	N/A	4	5
Annual fee	None	None	None	\$19.95 (Dow Jones), \$35.00 (MCI Mail)	None	None
Sign-up fee	None	None	None	\$29.95	None	None
Basic connect fees (local dial-up access):						
During prime-time hours (8:00-6:00 local time, M-F)	\$2.95 per hour	\$4.80 per hour ③	\$4.00 per hour	\$1.50 per 1,000 characters	\$12.50 per hour	\$2.95 per hour
During non-prime-time hours	\$2.95 per hour	\$4.80 per hour ③	\$4.00 per hour	\$1.50 per 1,000 characters	\$3.00 per hour	\$2.95 per hour
Additional fees						
9,600-bps dial-up	No charge	\$4.80 per hour ③	No charge	No charge	\$8.00 per hour	No charge
14,400-bps dial-up	N/A	\$4.80 per hour ③	No charge	No charge	N/A	N/A
800-number access	N/A	\$8.70 per hour	N/A	N/A	\$8.00 per hour	N/A
SprintNet (prime-time access)	No charge	\$11.70 per hour	\$9.00 per hour	No charge	\$2.00 per hour	N/A
Xstream (formerly Tynnet) (prime-time access)	No charge	\$11.70 per hour	\$9.00 per hour	No charge	N/A	N/A
Access via the Internet	N/A	N/A	\$3.00 per month	No charge	N/A	N/A
Advanced Services						
Real-time U.S. stock-quote service	None	None	None	Dow Jones	Charles Schwab	None
Fee	N/A	N/A	N/A	\$127.25 per month	\$1.45 per minute	N/A
Delayed current U.S. stock-quote service	PC Quote	Basic Quote	Dow Jones	Dow Jones	Investment Analyst	Dow Jones
Fee	No charge	No charge	7¢ per quote	No charge	6¢ per quote	No charge
Travel-service network	Easy Sabre	Easy Sabre	Easy Sabre	OAG	Easy Sabre	Easy Sabre
Fee	No charge	No charge	No charge	No charge	No charge	No charge
E-Mail Fees						
Messages sent (per recipient)	No charge	7,500 characters, 15¢; each additional 2,500, 5¢ ④	No charge	500 characters, 50¢; next 500, 10¢; each additional 1,000, 10¢; after 10,000 characters, 5¢ per 1,000	No charge	Composed on-line: no charge; com- posed off-line: 1¢ per 1,000 characters
File attachments	No charge	As above ④	No charge	As above	No charge	1¢ per 1,000 characters (10MB maximum)
Internet e-mail downloaded	No charge	As above ④	No charge	No charge	No charge	1¢ per 1,000 characters N/A
Return receipt	No charge	\$0.15	N/A	\$0.25	N/A	N/A
E-mail-to-fax service (U.S.)	\$2.00 per fax (30,000 characters maximum)	1,000 characters, 75¢; each additional 1,000, 25¢	One page, \$1.25; each additional half-page, 50¢	Half-page, 50¢; each additional half-page, 30¢	85¢ per page	\$1.25 per page (20 pages maximum)
E-mail-to-letter service (U.S.)	\$2.50 per letter (30,000 characters maximum)	One page, \$1.50; each additional page, 20¢	N/A	Three pages, \$2.00; each additional three pages, \$1.00	N/A	\$1.50 per letter (four pages maximum)

N/A—Not applicable. The service does not have this feature.

① New pricing was announced at press time, as discussed in the review.

② Local connection fees of \$2.00 per hour may apply; state and local taxes may also be added to basic rates.

③ This price is for extended services. CompuServe's basic service is free but does not include many popular services, such as access to on-line forums.

④ \$8.00 e-mail credit is included in the monthly basic-service fee.

T H E I N T E R N E T \$ 9 C R U I S E

E A S Y R I D E R .



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CIRCLE 222 ON READER SERVICE CARD

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Rule The Road. Throttle up and tool down the Internet. Ride Internet Chameleon straight into Hog Heaven. Well equipped to explore the road and hit all the hot spots. Hey, who says you were born to be mild?

All The Tools To Rule The Road: WebSurfer, Email, NEWTNews, File Transfer, Gopher, and more!

Book the \$9 Internet Cruise: Test drive the smoothest Internet front-end around. Take the \$9 Cruise and pick-up free highway fare. Call us: **1-800-558-7656** Ask for Department E3

The fastest just got faster.

It's hard to believe, but it's true. The EtherLink® III ISA adapter with Parallel Tasking®—the fastest adapter on the planet—just got faster. Up to 25% faster, in fact.

We've improved Parallel Tasking to speed up the market's best-selling, best-performing adapter. On top of that, Etherlink III has also

been performance optimized for NetWare®, with Novell's new Universal Client right in the box. But the jump in speed isn't its only new feature.

Recently, LANQuest Labs found EtherLink III to be both the fastest performing adapter and the easiest one to install. And now it's even easier. With AutoLink,™ you can automatically



configure and install EtherLink III in less than three minutes—including installation of Novell's Universal Client. Even better, we now support Plug and Play PCs.

As always, 3Com is committed to current users. The new 3C509B adapter is 100% backward compatible with existing EtherLink III adapters. Guaranteed or your money back.

And with 3Com's Transcend™ Workgroup

Manager you can manage both adapters and hubs from one integrated Windows™-based application.

For more information on the new 3C509B and a free copy of LANQuest Labs' performance benchmark report, call **1-800-NET-3Com**.

Because these things are guaranteed to move fast.



CIRCLE 293 ON READER SERVICE CARD

Coming Attractions

By Todd Spangler

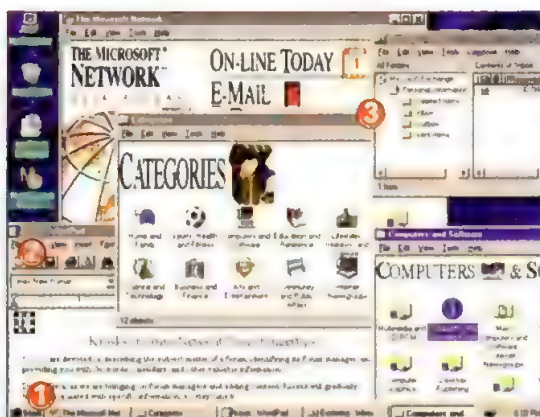
If you think it's difficult to choose between services now, just wait until more come on the scene next year. This next generation will be better graphically and easier to use, offer more information, cost less, and include advanced features.

You won't be able to ignore **The Microsoft Network** even if you want to. The service's front-end software is written into Windows 95—scheduled to ship sometime in 1995—and includes an option to sign up immediately after you install it. (Competitors already have complained about an on-line monopoly.)

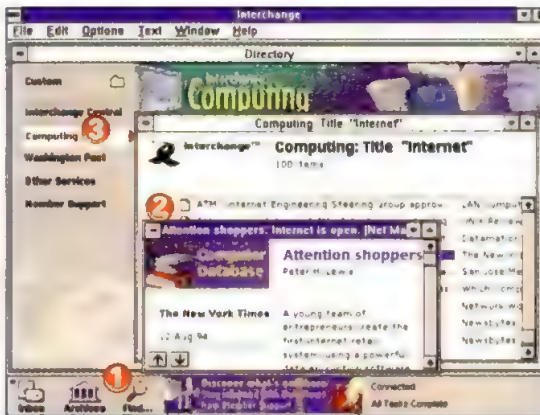
The Microsoft Network will integrate seamlessly with Windows 95 applications. And it will include all the standard features of an on-line service. Microsoft hopes to lure content providers by promising them a strong on-line identity via an interactive publishing tool. Users will pay a flat monthly fee, and providers will have complete control over pricing and advertising. With its potential installed base of 10 to 15 million users, The Microsoft Network will attract all kinds of companies that are eager for a presence.

We had expected to review the **Interchange Online Network** this year (which at press time had just been purchased by AT&T), but it's scheduled to launch in early 1995. Interchange will provide comprehensive special interest areas built around the concept of linked information.

Throughout the service, Lotus Notes-type links jump you to related topics and services; you'll be able to drag icons representing subjects of interest into your inbox to be updated



The Microsoft Network. (1) Built into Windows 95: Folders and documents act as extensions of the operating system. (2) OLE support: The object-oriented service will launch applications. You'll be able to embed multimedia objects into e-mail. (3) Integrated messaging: Microsoft Exchange will handle your e-mail from The Microsoft Network, your LAN, other on-line services, and the Internet.



Interchange Online Network. (1) Service-wide full-text indexing: You'll be able to search for a phrase across the whole service—in forums, e-mail, and documents. (2) Document-centric content: Drag-and-drop links to documents and other services will make navigation and downloading easier. (3) Specialized content areas: Interchange is developing in-depth areas for users who want more than basic information.

each time you log on. Interchange automatically saves local copies of e-mail and archived documents for off-line reading. The underlying data is full-text indexed.

One principal area will be Interchange Computing, created by Ziff-

Davis Interactive. Interchange Computing will add to the ZiffNet Information Service—which is now available on CompuServe and Prodigy. It will add editorial content, a three-year full-text archive of free publications, and 75 PC vendor forums.

Users will pay for one or more specific content areas and will have access to a general news and reference section. Interchange is also developing special interest areas with *The Washington Post*, Starwave Corp., the Minneapolis *Star Tribune*, and Cowles Business Media.

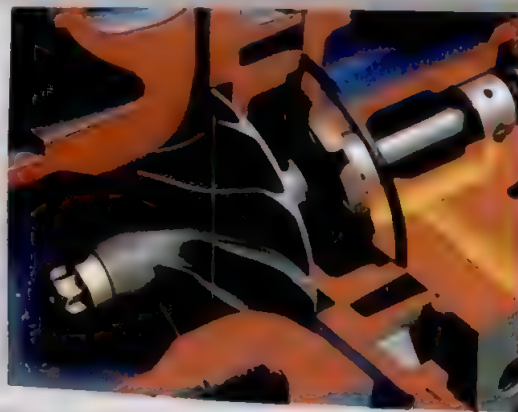
Launched for Macintosh users in June 1994, cozy and cute **eWorld** is the kind of on-line service you might expect from Apple Computer, which licenses its server software from America Online. Apple plans to make the service available later this year to Windows users. The company may need to add a PC Stadium with hardware and software vendors to its bucolic Town Square—eWorld's visual opening-screen—to attract PC users.

From AT&T comes an on-line service that's designed to be smarter, more portable, and more personalized. First available last September on the Sony Magic Link PDA, **AT&T PersonaLink Services** should become available to desktops and portable PCs this year.

PersonaLink Services uses "intelligent agents," software that performs assigned tasks remotely.

Finally, look for the **USA Today Information Network** from Gannett. The Network will expand the newspaper's on-line sports network to include information from Gannett and other providers. □

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Make it a reality with a ViewSonic monitor. And, since 17" monitors (15.7" viewable diagonal) are the size of choice by most professionals, we offer one for every budget and application. Take pride in knowing the image on your screen is bright, crisp and picture-perfect. Don't settle for less.

In addition to edge-to-edge focus, compatible with resolutions up to 1600 x 1280, and vertical refresh rates as high as 160Hz, our **NEW** ViewSonic 17 and 17G monitors feature OnView. This control system allows you to adjust the image via the on-screen menu, including color matching. Compare specs, price and performance — you'll See The Difference!

During the past year, our monitors have received 16 awards from major computer publications. Plus, ViewSonic was named in *Inc.* magazine's 1992 and 1993 top 500 fastest growing companies. In keeping with our commitment for environmental and energy conservation, these monitors surpass the strict Swedish MPR-II standards for low radiation and support the EPA's Energy Star program.

ViewSonic monitors . . . designed with your image in mind.

PC and MAC compatible.



	ViewSonic 17	ViewSonic 17G	ViewSonic 17E
Screen Size*	17"	17"	17"
Dot Pitch	0.27mm	0.28mm	0.28mm
Max Resolution	1600 x 1280	1280 x 1024	1280 x 1024
Max Refresh	160Hz	160Hz	90Hz
Honz. Frequency	30-82KHz	30-64KHz	30-64KHz
ViewMatch™ Color Control	Yes	Yes	Yes**
OnView™ Controls	Yes	Yes	No
Flat Square Screen	Yes	Yes	Yes
MSRP	\$1,045	\$945	\$865

* Diagonal viewable screen area of 17" monitor from top.

** Color temperature switching from 6500 K to 9000 K.



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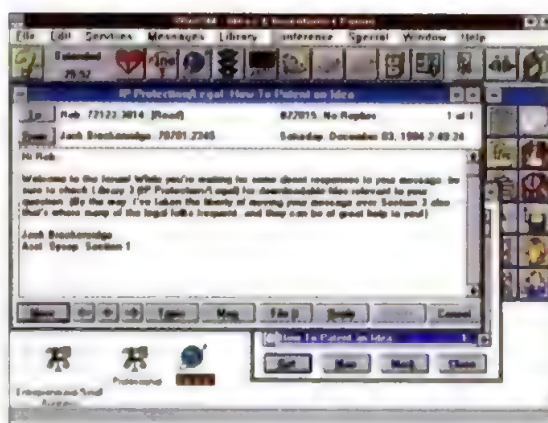
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main uncommonly strong. It doesn't have the great built-in interface of America Online, but most people use it with one of many other available interfaces. CompuServe could do with stronger Internet connectivity tools (FTP access was recently introduced), but it nevertheless remains the best choice for many users.

Connecting to CompuServe is relatively simple. But CompuServe's abundance of offerings can be daunting and may look disorganized despite front ends like CompuServe Information Manager for Windows (WinCIM), which we used in our review. The new Host Micro Interface (HMI), which replaces the outdated terminal emulation ASCII interface, is also your connection to the Internet.

The service's pricing will have undergone important changes by the time you read this (but at the time of our review, CompuServe's pricing plan was still full of additional charges). The service will be reasonably priced at a flat fee of \$9.95 per



CompuServe has more than 700 discussion forums, ranging from computer vendor support to science fiction.

services. You can send messages to 13 mail systems, including MCI Mail and the Internet. Files can be sent individually but not as attachments. Options such as return-receipt and an address book (offered through WinCIM) make this a complete service.

The news and financial sections are unmatched among the consumer-oriented services. AP Online offers extensive news and is updated throughout the hour; it includes international news wires. Al-

though it doesn't have the number of periodical providers that America Online does, CompuServe does offer the Newspaper Archives, which provides the two-day delayed full text of more than 50 major U.S. newspapers.

CompuServe has unique strength in the quality and variety of its more than 700 forums, which cover everything from computer-vendor support to science fiction to pets. Moreover, CompuServe forums are distinguished by their thoughtful level of conversation.

Checking stock quotes is simple: You may download up to 20 current quotes for stocks, options, indexes, exchange rates, and mutual funds per session at a 15-minute-or-greater delay from the floor. Meanwhile, if you're doing research, you can head for a comprehensive database or brokerage service, including *Money* magazine's FundWatch Online.

CompuServe's research databases for both the home and business user abound.

They cover such areas as health, computers, and general-interest magazines. Full text and abstracts are available from hundreds of periodicals.

The CompuServe travel services are extensive, too, with support for Eeasy Sabre and Worldspan Travelshopper. Information databases, including Travel Britain Online and regional forums, provide perspectives for potential visitors.

Game addicts also have plenty to cheer about. CompuServe has an active Multiplayers Games Forum, lots of shareware games to download, and the greatest number of game publishers' forums in any one location. You can download DOOM II at \$29.95 plus connect-time fees.

Since its introduction of Usenet Newsgroups access last August, CompuServe has slowly been catching up with the Internet explosion. CompuServe recently introduced FTP access and plans for World-Wide Web access by early this year.

CompuServe is still the most well rounded of these on-line services, and the best choice for many business users. It is, however, relatively lacking in some areas.



CompuServe's new graphical menus make a wide range of resources, including entertainment, more approachable.

month for the use of any of 100 basic services, including news and weather information, Eeasy Sabre, and the equivalent of 60 three-page CompuServe e-mail messages (or \$9 free credit per month). Extended services, which include CNN Online, European railway schedules, and AP Sports Wire, can cost up to \$4.80 per hour.

CompuServe's e-mail service is the most full-featured among the competing

FACT FILE

CompuServe Information Service

Requires: 8088-based PC or better, 2MB RAM, 2MB hard disk space, modem (1.2 Kbps to 14.4 Kbps), any communications software, CompuServe Information Manager front-end software recommended (Microsoft Windows front ends will require Windows and a better system) **In short:** CompuServe is still the best choice for the general business user and for many home users. It remains the most comprehensive of all on-line services, offering the best mix of business, research, and leisure resources. It has a wide range of discussion forums with amply stocked file libraries, and its versatile e-mail system is the most complete here. Still, CompuServe's interface (even as viewed through the popular WinCIM front-end software) could be improved, and the content needs better organization. Also, the variety of surcharges for everything from forum use to Internet

SUITABILITY TO TASK	
Installation and orientation	GOOD
Content	GOOD
Interface	GOOD
E-mail	FAIR
Discussion groups and forums	EXCELLENT
Internet connectivity	FAIR

401 on reader service card



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PC MAGAZINE, Cover Story: Notebooks, Aug. 1994



"...the WinBook XP is a great Windows PC, and an excellent value." "...the fact that you get the amount of performance we did from a battery charge speaks highly of the engineering that went into the WinBook XP."

LAPTOP BUYERS GUIDE & HANDBOOK, First Look, Dec. 1994



"In terms of value,...(the WinBook XP) ranks above many famous-name notebooks. And in terms of pointing devices, it's definitely got them out-numbered."

"...if you're looking for a well-equipped, wallet pleasing portable, the WinBook XP deserves a spot on your short list." "...the WinBook with modem is \$700 less than a comparably equipped, modemless (Dell Latitude XP) 475C."

COMPUTER SHOPPER, PC Reviews, Nov. 1994



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WINDOWS MAGAZINE, WinLab First Impressions, Dec. 1994



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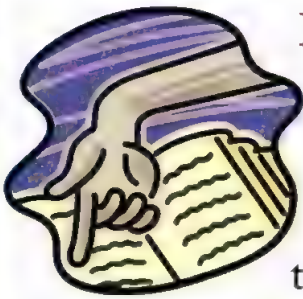
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The Scavenger Hunt

By Gail Shaffer



Looking for information on-line can be a hit-or-miss proposition. Sometimes the first key-

word you try turns up zilch, or you go through a couple of choices for sources of information until you find the best one. The more time you spend on-line exploring services and sources, the more shortcuts you'll find and the better you'll get at it.

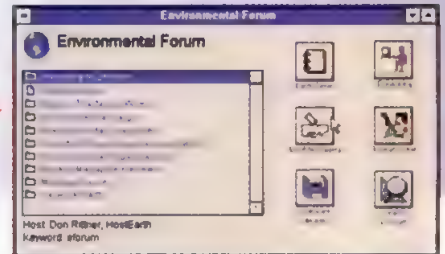
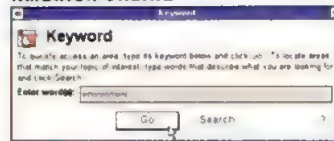
We asked our reviewers of America Online, CompuServe, and Prodigy to do an on-line search for information on recycling in New York. Our purpose was two-fold: to locate specific information on the subject and to observe the process of the search.

On each, the keyword "recycling" turned up nothing, but "environment" worked for all three. In each case it took a larger number of screens than we have shown to accomplish the searches. Prodigy took the most screens but gave us the best information. The America Online and CompuServe searches were interesting. But they were not fruitful for our subject.

With America Online we located six topics, all of them a year old. Our search on CompuServe was the least successful: we uncovered only an old listing of state-environmental-agency contacts.

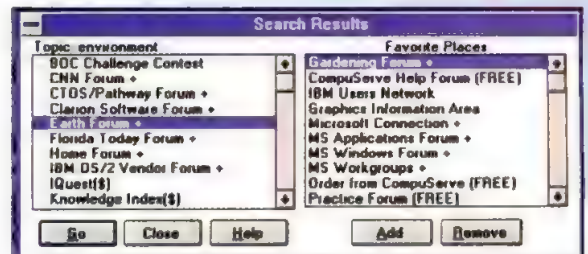
The moral of the story: Keep spending time on-line. (It won't always seem like a scavenger hunt, we promise.) Investigating the many sources of information on-line will yield many returns for you professionally and personally. □

AMERICA ONLINE



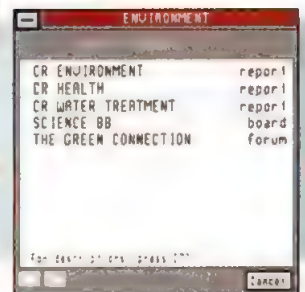
The keyword got us to the Environmental Forum, where we first chose "Ecolinking." But it turned up nothing toward our search.

COMPUERVE

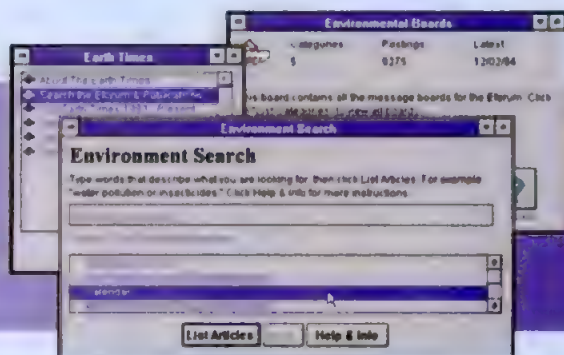


Here, "environment" got us to a variety of topics. We selected Earth Forum, then went to the Library Sections and chose "Recycle/Wastes." This was. . .

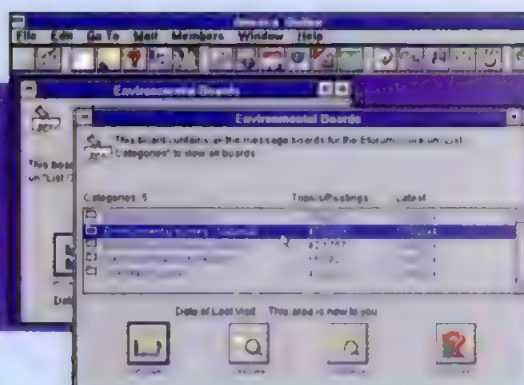
PRODIGY



After two false starts in the Home/Family/Kids section, "environment" yielded Consumer Reports/Environment with an explanation, then the Environment window.



We then tried Environmental Boards and searched for "recycling,new.york." We selected Calendar out of six articles which turned up information from the summer of 1992.



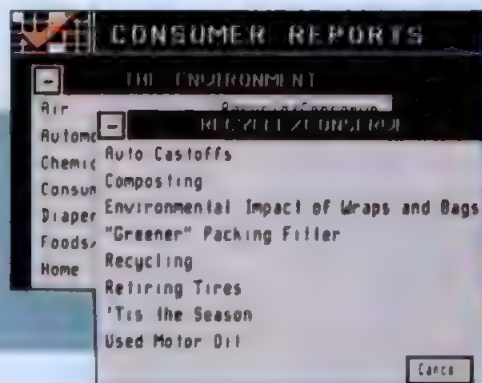
Back to Environmental Boards, we selected Environmental Issues—National. This took us to an interesting forum, but left our hunt in the lurch.



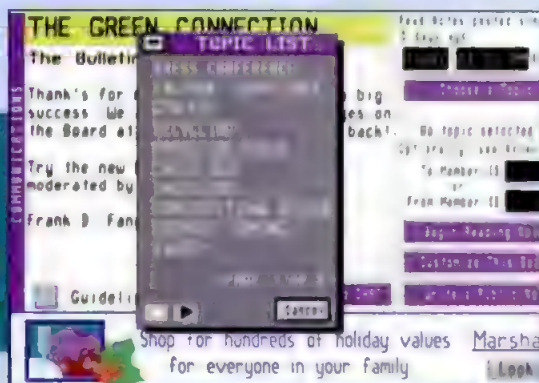
... basically a waste of time. We selected the recent library files list, but found nothing for our search. We finally found a listing of U.S. Government environmental offices that seemed a good choice.



But the closest match was a 1990 listing of state environmental agency contacts. We searched for another hour but found nothing specific to recycling in New York.



"Recycle/Conserve" led us to the correct information—an article from February 1994 about recycling in New York.



The hunt complete, we ventured further to "The Green Connection" group forum, a mostly product-oriented place: The bulletin board had only three notes posted.

Delphi Internet Services Corp.

• Delphi Internet

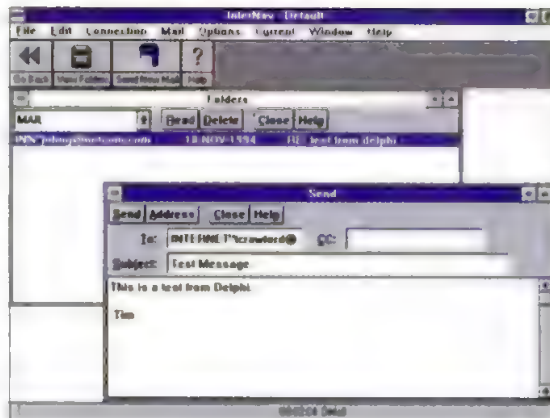
BY PADRAIC BOYLE

The leader for Internet connectivity in this field, Delphi Internet is the only service here to offer a complete set of services and tools for seamlessly exploring the Internet. Even so, you'll need some knowledge of the Internet to get started. Delphi also offers its own services, includ-

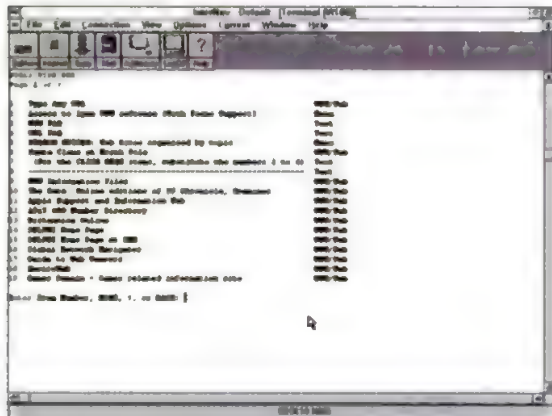
Xstream (formerly called Tymnet), the Internet, and a direct dial-up number for members in the Boston and Kansas City areas. Beware, though: SprintNet and Xstream each add a surcharge of \$9 per hour during business hours. Delphi also offers a free 5-hour trial period. And for newcomers, Delphi provides useful services such as guided tours, on-line documentation, and tips.

The company offers two different pricing options. The 10/4 Plan costs \$10 per month with the first 4 hours each month free, after which an hourly charge of \$4 kicks in. The 20/20 Advantage Plan costs \$20 per month, with the first 20 hours each month free; then it's \$1.80 per hour for additional time (there's a one-time fee of \$19). Internet access costs you another \$3 per month for either plan—but that's very worthwhile.

The Delphi connection provides access to Internet services such as the Web, Usenet Newsgroups, gopher, and tools



Don't expect anything more than the basics with Delphi's e-mail service. You can't request return receipts, and it's not easy to attach binary files.



With Delphi's connection to the World-Wide Web, you can connect to a wide variety of services.

ing news, weather, sports, and travel. Its e-mail facility is outdated, however, and it is difficult to locate information. Perhaps the company will address these and other concerns in a new version of the software due out sometime this year. Right now, though, it's not the best choice as a balanced service.

Delphi's new front end will be similar to that of the graphical World-Wide Web browsers shipping today (see the article "Web Browsing: The Web Untangled," *PC Magazine*, February 7, 1994) and will include hyperlinking and multimedia support. It will provide a standard interface across both Delphi and the Internet, as well as gopher and FTP for Internet documents.

Delphi's current interface—InterNav, Version 1.11—is a Windows-based, VT-100 terminal emulator. It is easy to install and allows you to automate logging in, but InterNav's menus are text-based even though it is a Windows front end. You can, however, point and double-click on a menu selection, and the number or word is passed through to the prompt.

Users can connect to Delphi through several options, including SprintNet,

► FACT FILE

Delphi Internet

Requires: 386-based PC or better, modem. **InterNav** software requires Windows. **In short:** Delphi Internet offers the best Internet connectivity in this field, but you've still got to know what you're doing to access information, which can be difficult to find, and its e-mail service is outdated. Delphi plans to release new software this year, which should make navigating much easier. Given the better front ends and more well-rounded services that are available now, Delphi may not be your first choice—unless you're after the Internet.

Delphi Internet Services Corp., 1030 Massachusetts Ave., Cambridge, MA 02138, 800-695-4005, 617-491-3342, fax, 617-491-6642, e-mail, askdelphi@delphi.com. For a 5-hour free trial, you can dial into Delphi at 800-695-4002. Username JOINDELPHI, password FREE.

SUITABILITY TO TASK	
Installation and orientation	FAIR
Content	GOOD
Interface	FAIR
E-mail	POOR
Discussion groups and forums	GOOD
Internet connectivity	GOOD

462 in reader service card

such as finger and PING. The tools are text-based, however, and require some basic knowledge to be useful. The majority of the information accessible through Delphi is located on the Internet. The News Corporation, Delphi's parent company, also owns BIX, a specialized on-line service for computer professionals with Internet access.

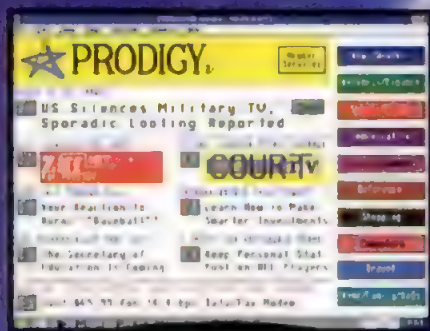
It's not easy to get at information on Delphi. When you search for topics or information, you must wade through several layers before finding what you want. In many cases, the information is located on the Internet, and you are bound to the throughput of the service. We also found that some services were not available when we tried to access them because they were full.

You can connect to Internet sources via gopher for news, on-line shopping, sports, computer hardware and software support, and games. You can access stock quotes, which are updated every 20 minutes, but you cannot purchase stocks. One big drawback is that none of the major computer-industry players have a direct presence on Delphi, although you can access forums in which the participants seem well versed in their areas.

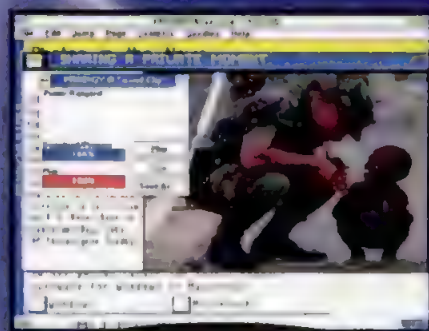
News and sports sections provide reports from Reuters and UPI. Delphi's on-line shopping is particularly strong. Multi-player games are available, and you use gopher to travel to related materials in newsgroups or directly onto a game vendor's home page.

Delphi's e-mail implementation is archaic. For example, although you can

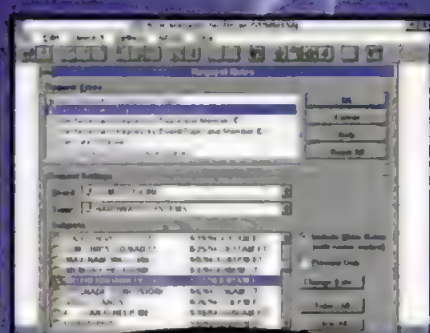
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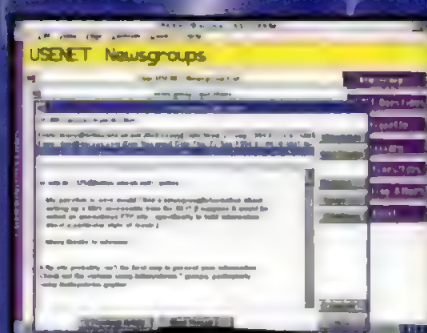
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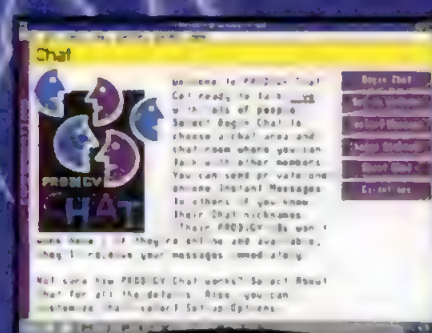
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New Windows™ Look

- Now PRODIGY has advanced **Multimedia** capabilities like sound bytes and pull-down photos which bring features to life.
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Information to Go, Please

By Bill Howard

If you need to move information wirelessly today, you can. But it won't be cheap, easy, or 100 percent reliable. Here's an overview of what you can do.

THE INFORMATION

You can receive personal e-mail or broadcast messages to colleagues. You can get stock quotes, headline news, and news about the industry you work in. With some wireless technologies, you can also originate and respond to messages.

Here's how it might work if you're a pharmaceuticals rep on an out-of-town business trip. While you're asleep, your PCMCIA pager card receives updated price lists and inventory status on your most critical products. When you turn your notebook PC on in the morning, it automatically updates your price-list database. En route to your first appointment, you get headline news on the health-care industry that keeps you abreast of your competitors and gives you a good conversation starter. Throughout the day, the subject lines and the first sentences of all e-mail messages marked "urgent" or from your boss are forwarded as well.

With a two-way device, you could do all this and place your orders without the need of a telephone jack.

WIRELESS TECHNOLOGY

Paging, or one-way wireless messaging, is the simplest technology. The signal penetrates deep into buildings; it works nationwide and in many other countries. For portable PCs and PDAs, pagers take the form of Type II PCMCIA cards with reader software in the computer. Currently, they're one-way (receive only), but within the year some pagers will be able to issue short responses on the order of "got the message," "yes," and "no."

We're seeing the first PCMCIA pagers now with built-in LCD displays.

Services include Embarc from Motorola International Networks Division (800-362-2724), MobileComm Nationwide Messaging from BellSouth (800-685-5555), and SkyPage from SkyTel Corp. (800-759-9779).

Cellular data is a great concept that barely works. You need your cellular phone, a cellular-ready modem, and a \$100 cable to connect the two. Expect 2.4-Kbps data throughput when you're standing still and nothing when you're moving. Look into modems with special cellular error-checking: Celeritas's

For wireless two-way messaging outside your company, Radio Mail runs over Ardis or RAM. One-way wireless messaging is the simplest technology.

TX-CEL from Toshiba America Information Systems, ETC from AT&T, and MNP 10 from Microcom.

In the few areas where it's available, CDPD (cellular digital packet data) piggybacks a digital signal onto unused cellular frequencies. It's great for short, bursty messages. CDPD modems cost \$300 to \$1,500 (they're not the same as digital cellular phones). CDPD is backed by McCaw Cellular Communications and AT&T, McCaw's new owner.

Two-way messaging uses RF (radio frequency) modem transceivers the size of your notebook PC's power transformer and plug into your notebook's serial port. You need one RF modem (\$500 to \$1,000) for each roaming computer, as well as one back in the office on a file server that transmits to the service provider (or you can

use a phone link to the service provider). Service providers include Ardis (800-662-5328) and RAM Mobile Data USA LP (800-726-3210). To communicate via RAM Mobile's network, you can use e-mail programs such as cc:Mail or Microsoft Mail. If you're more interested in communicating outside your company, RadioMail (from RadioMail Corp., 800-597-6245) works atop Ardis or RAM.

In 1995, SkyTel's parent, Mobil Telecommunication Technologies Corp. (Mtel), hopes to have a two-way pagerlike system. Desitneer, with a fast outbound channel (to your remote device) and a slower, battery-conserving return channel. Metricom (800-556-6123) plans a two-way, peer-to-peer service using spread-spectrum technology. When several devices are close by—on the same corporate campus, for instance—they can talk among themselves without going through the Metricom network.

PCS, or personal communications services, will receive and send data, faxes, voice, and eventually video. Expect them around 1997 or 1998 at the earliest.

WHAT IT COSTS AND WHO SELLS IT

Costs vary widely, and vendors are subsidizing early adopters to build interest. Here are some ballpark prices. Some two-way networks offer fixed-priced service for \$75 to \$150 a month. Paging with nationwide coverage might run about the same, escalating quickly if you send a lot of messages. Cellular service costs 50 cents to a dollar a minute, plus roaming charges outside your local area. Pagers cost \$200 to \$300, cellular modems are \$200 to \$500, and two-way RF transceivers are \$500 to \$1,000.

You can buy products and service from a variety of services, including paging companies, makers of PDAs and personal communicators, and regional phone companies.□

A Change of Face

By Robert P. Lipschutz, Tim M. Crawford, John Garis, and Russ Iwanchuk

If you like your on-line service because of its content, services, and pricing—and yet you're not crazy about the interface—you may be in luck. Each of the services in our roundup has at least one alternative front end that you can buy.

We rounded up some Windows front ends that provide a different slant or add value to the reviewed on-line services. These are in addition to the front ends we used to review the services, most of which were Windows-based. We also evaluated various front ends for DOS, OS/2, and Macintosh systems. Read on to see if anything here catches your eye. We've indicated for each one whether it offers an on-line reader only, an off-line reader only, or both capabilities.

FOR AMERICA ONLINE



America Online for Macintosh

The Macintosh version of AOL is similar to its Windows cousin, although one difference we noticed is that at the sign-on screen, you have the option of selecting Home (for dial-up operations) or TCP. The TCP option is used if you are connected to a TCP/IP-based network that is in turn connected to the Internet. The TCP option is typically faster than a standard dial-up connection if your network connects to the Internet over a Switched 56 or T1 line. In the Windows version, getting to the TCP/IP option is not as obvious. Macintosh-interface screens are interesting and colorful, but the first time you enter a new area you can expect to wait a couple of minutes while you download the graphics for that screen.

America Online Inc.: 800-827-6364; free.

FOR COMPUSEVE INFORMATION SERVICE



CompuServe Navigator for Windows

If you're looking for a way to use CompuServe without racking up those large connect charges, this product is for you. Mail and forum mes-



Journalist automatically downloads and presents requested news and information from CompuServe.

sages can be read off-line, so that only a relatively short period of time must be spent on-line to post the messages.

To do this, you create scripts that indicate the appropriate forums as well as the message options. When you run the script, it dials CompuServe, sends and receives any new messages in the forums that you've selected, and disconnects. This is not a complete replacement for WinCIM, however: Interactive tasks are not possible.

CompuServe Inc.: 800-848-8199; upgrade price, \$30 (includes \$10 usage credit). Download at "Go CISSOFT."



FlexCIS 2.1

Now in Version 2.1, FlexCIS is a full 32-bit program intended to run on Windows NT and Windows 95. It can be run on a Windows 3.1 system with Microsoft's Win32s sup-

port, available via downloading, though we found this somewhat unstable. The interface on this software is very straightforward and fairly intuitive. You do spend some time wading through obscure pull-down menus. This is one of the few programs that provides access to Usenet news. FlexCIS is \$65 shareware and limits access to two forums and two Usenet newsgroups until the registration fee is paid.

Object Evolution; 800-800-5105; \$65; CompuServe e-mail: 74724,1637. Download at "Go WINSHARE, Win NT Utils/Apps library."



Journalist for CompuServe

Journalist is not just another front end. It is a Windows-based hybrid between a desktop publishing package and a CompuServe interface. Just tell Journalist the type of information you would like to see every day (information about finance or the arts, for instance), and it will automatically download and paste this information into a colorful newsletter.

We would, however, like to see forums included in the options, and we did have some trouble using a special ZiffNet CompuServe account. Still, it is the most innovative package reviewed and is certainly worth a look. Journalist is also available for Prodigy.

PED Software Corp.: 800-548-2203; \$79.95 (includes \$60 usage credit); e-mail: info@ped.com.



NavCIS Pro 1.25

This CompuServe navigator is among the most highly developed of the front ends we looked at. It has the WinCIM-type interface with buttons for access to stock quotes and weather, and even a button to retrieve billing information. You can also create customized buttons.

Dvorak promises a future version that will support Usenet newsgroups.

More Changes of Face

NavCIS Pro 1.25 is shareware, and the 30-day timed edition is available via a download. To upgrade to Version 1.25 from the timed edition costs \$69.

Dvorak Development and Publishing Corp.; 800-861-0345; \$69; CompuServe e-mail: 71333,11. Download at "Go DVORAK, Free Software library".

WigWam 2.00i

This Windows navigator from Ashmount Research is a shareware program and comes registered for 14 days. WigWam has menu-bar buttons along the top of the window, much like the WinCIM CompuServe browser. The icons that appear on the buttons are not very informative, but users can create customized buttons. The atypical interface notwithstanding, this program performs very solidly.

Ashmount Research; 44-71-935-7712 (U.K.); \$99.95; CompuServe e-mail: 70007,5437. Download at "Go ASHMOUNT, WigWam library".

CompuServe Information Manager for DOS

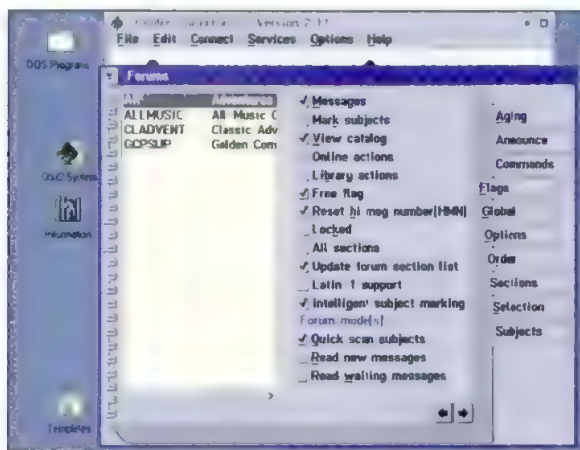
If you're looking for a way to access CompuServe from DOS, you won't be intimidated by the straightforward interface. This front end is organized like its Windows and Macintosh CIM counterparts. The interface is well designed, considering the limitations inherent to a DOS text-based interface. One thing to keep in mind when you are using this interface: The Esc key is your friend. If you get buried deep within a menu structure, you can hit Esc to bring you back out one level at a time. (CompuServe is also preparing to release a version of CIM for OS/2 users.)

CompuServe Inc.; 800-848-8199; upgrade price, \$10 (includes \$10 usage credit). Download at "Go CISSOFT".



OzCIS 2.0c(5)

Here's a DOS-based shareware navigator with a Windows-style interface and mouse support. It features automated support for non-forum weather reports



Golden CommPass is a powerful on-line/off-line CompuServe front end for OS/2 users.

and stock quotes. The downloaded software is fully functional and has a 30-day trial period. To register this software costs \$40 for personal use; otherwise, it costs \$60 plus shipping.

Ozarks West Software Inc.; personal, \$60; business, \$80; CompuServe e-mail: 74774,417. Download at "Go OZCIS, OzCIS V2 Files library".



TapCIS 5.43b

Like Golden CommPass and the CompuServe Navigator, TapCIS is an off-line mail and forum interface—but DOS-based. TapCIS is not for the beginner who might be intimidated by the interface. But if you're a CompuServe power user who's seeking a DOS-based off-line product, TapCIS has proven itself over time. Once you get to know the DOS text-based interface, it's simple to navigate through the messages.

Support Group Inc.; 800-872-4768;

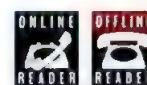
\$79; CompuServe e-mail: 74020,10. Download at "Go TAPCIS".



Golden CommPass 2.11

For OS/2 power users, Golden CommPass is an off-line mail and forum interface that works off a similar premise as the CompuServe Navigator products. But unlike the single-page setup that the Navigator products employ, Golden CommPass requires you to go through several pages to set up each desired forum. Once setup is complete, however, you won't have any trouble monitoring the forums. Designed with OS/2 users in mind, each setup screen uses the traditional OS/2 Presentation Manager's notebook-tab style.

Creative Systems Programming Corp.; 609-234-1500; \$99; CompuServe e-mail: 71511,151. Download demo version at "Go GCPSUPPORT".



CompuServe Information Manager for Macintosh

This Mac-based front end has the same buttons and similar menus as its cousin, WinCIM. Taking advantage of the Macintosh GUI, the interface looks a bit better but provides the same functions as the Windows version.

CompuServe Inc.; 800-848-8199; upgrade price, \$10 (includes \$10 usage credit). Download at "Go CISSOFT".



CompuServe Navigator for Macintosh

The CompuServe Navigator for Macintosh has the same look and feel as the Windows version. When you're creating a script, you're forced to wade through many screens for even a simple change. It's a bit more cumbersome than its Windows counterpart, but once the scripts are created, it's a time-saving package.

CompuServe Inc.; 800-848-8199; upgrade price, \$30 (includes \$10 usage credit). Download at "Go CISSOFT".

More Changes of Face

FOR DELPHI INTERNET



Win-D 1.0

With Win-D, Windows users can automate many of the tasks performed in interactive Delphi sessions, such as sending and receiving mail and performing file transfers. For example, you can create scripts to have Win-D automatically log on to Delphi, upload e-mail you prepare using Win-D's e-mail editor, download new messages, transfer files, and then log out of Delphi—all in one action.

Win-D does not, however, completely shield you from Delphi's text-based interface. You still see Delphi's text-based menus on-screen, with Win-D inserting the appropriate commands at various command prompts to automate routines. To navigate on-line, you can use Win-D's pull-down menus to jump to places within Delphi or across the Internet using FTP. Win-D also lets you click on any text on-screen to help you maneuver through Delphi's on-line menu structure.

Circular Logic; 610-584-0300; \$39; e-mail: perry@delphi.com. Download in the Computing Groups Forum, in the D-LITE Forum on Delphi.

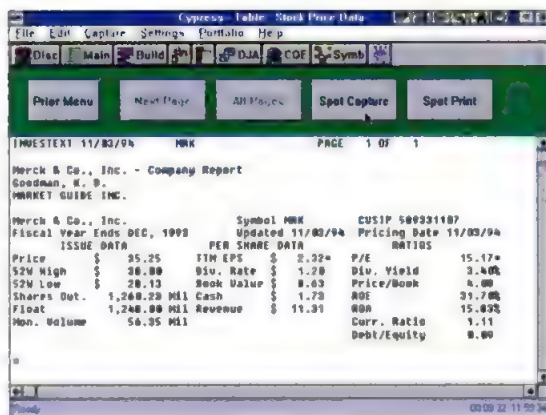


OS/2 Delphi Navigator

OS/2 users should try the OS/2 Delphi Navigator (ODN) to interact with Delphi. Like Win-D, OS/2 Delphi Navigator manages your Delphi sessions for you; you let it talk directly with Delphi to perform all the actions you want, such as sending and receiving e-mail, downloading SIG messages, and transferring binary files. Then you use the slick user interface to view all your new messages. Messages are clearly sorted

by thread, and responding to a message is as easy as clicking on a button. Furthermore, ODN's text editor is easy to use, and you can embed sound files in your messages that others can play automatically upon receipt.

OS/2 Delphi Navigator; \$35; e-mail:



For Dow Jones Fans, Cypress provides a Windows interface that is far superior to the one shipped with the service.

rollert@delphi.com. Download in OS/2 Custom Forum on Delphi (Custom Forum 41).

FOR DOW JONES NEWS RETRIEVAL



Cypress for Dow Jones News/Retrieval

Cypress provides a true graphical user interface far superior to what you find in the Windows 3.1 software that Dow Jones includes (a Macintosh version is planned). Cypress organizes the Dow Jones environment and provides mouse-clickable buttons to navigate down through selections. Shielding the user from Dow Jones' arcane terminal interface, Cypress also adds some good features. These include buttons for spot capture, printing, and reverting to a prior menu, which makes traversing the menus and capturing information a breeze. Once you have used this Windows front end, you won't want to go back to other interfaces.

Trax Softworks Inc.; 800-367-8729; \$179; e-mail: info@traxsoft.com.

FOR GENIE



Aladdin 1.72

This software combines a straightforward DOS interface with some time-saving canned scripts to make your on-line GENie experience more productive. Among other things, Aladdin permits user-created menus that automate roundtable discussions. For example, a user may download all new RT messages or only download those messages that he or she has taken part in. GENie's e-mail is automated in the same way.

GE Information Services Inc.; 800-638-9636; free. Download by typing "FRONTEND".

FOR PRODIGY



Journalist for Prodigy

(See Journalist for CompuServe.)

PED Software Corp.; 800-548-2203; \$29.95; e-mail: info@ped.com.



Prodigy for Macintosh

The toughest part about this interface was getting it up and running. After three attempts, we called Prodigy's technical support. We learned about the undocumented fact that the application can run only on Power Macs, Performa 475s and higher, and certain models of Macs built on the Motorola 68040. The statement AVMAC=1 needs to be placed in your Prodigy settings file for successful operation. Prodigy also informed us that depending on your system, you may need a different statement to get the application to run. Once you get the application running, you can expect to see the same interface as in the Windows version. (Prodigy is also preparing a front end for OS/2 users.)

Prodigy Services Co.; 800-776-3449; free.□

send binary file attachments, it's not as simple to do as it is with CompuServe's e-mail. In addition, you cannot request return receipts, and even though an address book is available, you need to create it in a separate ASCII file or use the InterNav address book.

Delphi can be a portal to vast amounts of information because of its superior Internet connections. But you'll need some basic Internet knowledge to make this service a worthwhile investment. The new front end, due out sometime this year, might help make Delphi a powerful on-line service that is also easy to use.

*Dow Jones & Company Inc.
MCI Global Messaging Services*

● Dow Jones News/ Retrieval with MCI Mail

BY ROBERT P. LIPSCHUTZ

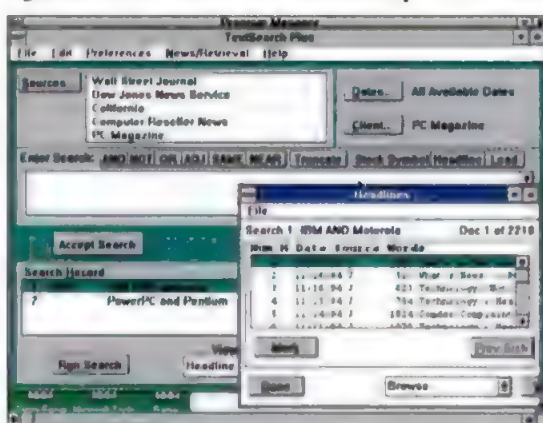
At the far end of the business spectrum in this roundup is Dow Jones News/Retrieval with MCI Mail. If you need or are interested in extensive business, financial, and investment information and can live without many personal or home-oriented services, Dow Jones is for you.

While other services here offer some content for the business user, Dow Jones delivers the most comprehensive, quality

historical and real-time information. But this specialization comes at quite a price, as you can see from our cost comparisons, so we recommend it only for the most serious business users.

Installation was no problem. A standard Windows setup is followed by configuration of the modem and session pa-

rameters. Dow Jones can be accessed via SprintNet and Xstream (formerly Tymnet) and the service provides a toll-free number for users to find local access numbers. Currently, no front ends are offered for DOS, OS/2, or Macintosh, so these users are left to face a cryptic terminal interface. But even under Windows, don't expect much of a graphical interface. Dow Jones's News/Retrieval Link and TextSearch Plus (TSPlus) have text-based terminal interfaces. You're better off using Cypress, a graphical front end now available for Dow Jones (see the sidebar "A Change of Face").



TextSearch Plus provides outstanding results with its combination of powerful Boolean searches and more than 1,800 sources of information.

rameters. Dow Jones can be accessed via SprintNet and Xstream (formerly Tymnet) and the service provides a toll-free number for users to find local access numbers. Currently, no front ends are offered for DOS, OS/2, or Macintosh, so these users are left to face a cryptic terminal interface. But even under Windows, don't expect much of a graphical interface. Dow Jones's News/Retrieval Link and TextSearch Plus (TSPlus) have text-based terminal interfaces. You're better off using Cypress, a graphical front end now available for Dow Jones (see the sidebar "A Change of Face").

Dow Jones goes off the beaten track in other areas as well. Instead of an integrated e-mail service, for example, Dow Jones provides a gateway to MCI Mail. MCI charges you directly for your e-mail usage; Dow Jones provides a convenient interface for connecting to the outside world. Because MCI also connects to the Internet, you will have plenty of potential recipients.

Dow Jones's mix of other services is

miscellaneous and spotty, and they all cost more. If any of the following services are areas you're looking for on-line, you need to look elsewhere: Dow Jones does include services such as a travel-research and booking service, movie and book reviews, and an on-line shopping forum. Nevertheless, OAG Travel and its more powerful cousin, Eaasy Sabre, are both available on other on-line services at lower cost. You could spend more than the price of a bound book downloading the book's review from Dow Jones. And even the most impulsive shopper could be discouraged by a cryptic command-line interface.

SERIOUS BUSINESS

When it comes to business, however, nobody gets down to it like Dow Jones. There's a whole lot more than just stock prices. An array of analyst information, including earnings reports and projections, are available. Even though Dow Jones does not charge a monthly fee, its reports—like most information on Dow Jones—come at a hefty price of \$1.50 to \$2.25 per 1,000 characters, plus a per-report fee ranging from a few dollars to over \$100. We down-

DATE	HIGH	LOW	CLOSE
11/10/94	72 5/8	71 5/8	72
11/11/94	73	71 3/4	72 3/8
11/14/94	73	72 1/4	72 7/8
11/15/94	73 7/8	73 1/2	73 1/8
11/16/94	73 1/8	72 5/8	73 1/4
11/17/94	73 3/4	72 3/4	73 1/8
11/18/94	73 3/8	72 3/4	73 1/4
11/21/94	74 1/8	72 5/8	72 7/8
11/22/94	75 7/8	69 3/8	73 1/2
11/23/94	70	69	69 3/4
11/28/94	70 7/8	70	70 3/4
11/29/94	71 5/8	70 1/4	70 5/8

News/Retrieval may not have a glamorous interface, but it offers up-to-date financial market quotes and analyst information.

loaded a 13-page Merrill Lynch report for about \$30.

A quick check of the business and financial news provided through Dow Jones news wires, which are updated continually, can put a day's events in context finan-

▶ FACT FILE

Dow Jones News/Retrieval with MCI Mail

Requires: 8088-based PC or better, any communications software, modem. **In short:** Dow Jones means serious business. This is not a general-purpose on-line service, but for its intended audience, this is a great resource. With more than 1,800 newspapers and publications as sources, along with up-to-date information on the financial markets, Dow Jones keeps the serious business user informed. Its pricing helps tell the tale: at \$1.50 per 1,000 characters for a report (plus many other premium fees).

Dow Jones charges
add up quickly

Dow Jones &
Company Inc., P.O.
Box 300, Princeton,
NJ 08543-0300,
609-452-1511, fax,
609-520-4775, e-
mail, djnr-support@cor.dow-jones.com.

403 on reader service
card

SUITABILITY TO TASK

Installation and orientation	GOOD
Content	FAIR
Interface	FAIR
E-mail	FAIR
Discussion groups and forums	N/A
Internet connectivity	N/A

N/A: Not applicable

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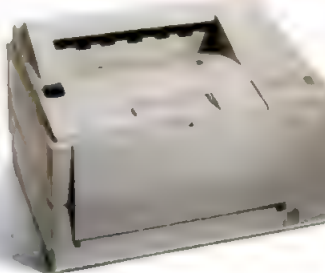
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450/DX2 \$1813 IBM Credit Lease \$85/month*	450/DX2 \$2245 IBM Credit Lease \$98/month*	Pentium 60 \$2913 IBM Credit Lease \$104/month*
466/DX2 \$2063 IBM Credit Lease \$74/month*	466/DX2 \$2495 IBM Credit Lease \$38/month*	
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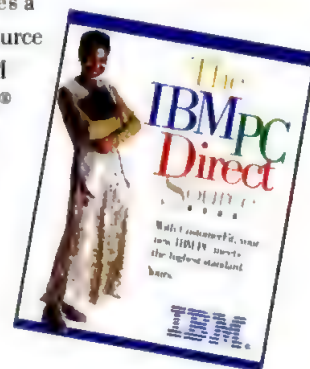
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<table border="0"> <tr> <td>Additional 8MB RAM* (2 X 4MB)</td> <td>\$470</td> </tr> <tr> <td>Additional 16 MB RAM* (2 X 8MB)</td> <td>\$930</td> </tr> <tr> <td>Additional 728MB IDE Drive</td> <td>\$335</td> </tr> <tr> <td>ISA® Ethernet 10BaseT/2/5 Adapter</td> <td>\$108</td> </tr> <tr> <td>ISA Ethernet 10BaseT Adapter</td> <td>\$89</td> </tr> <tr> <td>ISA Token-Ring 16/4 Adapter</td> <td>\$305</td> </tr> <tr> <td>OS/2 LAN Server v3.0 entry with OS/2 2.11</td> <td>\$615</td> </tr> </table>		Additional 8MB RAM* (2 X 4MB)	\$470	Additional 16 MB RAM* (2 X 8MB)	\$930	Additional 728MB IDE Drive	\$335	ISA® Ethernet 10BaseT/2/5 Adapter	\$108	ISA Ethernet 10BaseT Adapter	\$89	ISA Token-Ring 16/4 Adapter	\$305	OS/2 LAN Server v3.0 entry with OS/2 2.11	\$615
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*Memory upgrades may be manufactured in Japan, Italy, Germany, South Korea, U.S.A., Ireland or Canada															

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or even doing a little competitive analysis, TSPlus will make you an expert.

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GE Information Services Inc.

• GENIE

BY AMARENDRA SINGH

Though somewhat expensive, GENIE is an excellent source of business, technical, and general information for the professional user. Its interface and content are showing some dustiness, but GENIE now has a Windows front end, and significant Internet access is planned. In all, this is an impressive but potentially costly on-line package.

Getting setup was not as easy as with

■ The Line on New Services

By Frank J. Derfler, Jr.

You've read lots about on-line, but how about in-line? In-line services are a big business, and both AT&T and MCI are poised to make new things happen in 1995.

Unlike the on-line services in the main roundup here, which sell their content, in-line services focus on transporting your data. In-line services have been around for more than a decade in the form of X.25 and frame relay networks run by AT&T, British Telecom, MCI, Sprint, WilTel, and many other carriers. The classic in-line carriers offer only a pipe—that is, they carry the data reliably but don't add to it.

Now, AT&T and MCI have put some "new-line" twists into in-line networks—that is, the companies intend to make an intimate new connection between your LANs that also adds to the data they carry.

The AT&T NetWare Connect Services and AT&T Network Notes will roll out throughout 1995. Overall, the companies' announcements focus on linking LANs using Novell's IPX protocols. By using the native LAN protocols without repackaging, the large AT&T network becomes a true extension of your local network.

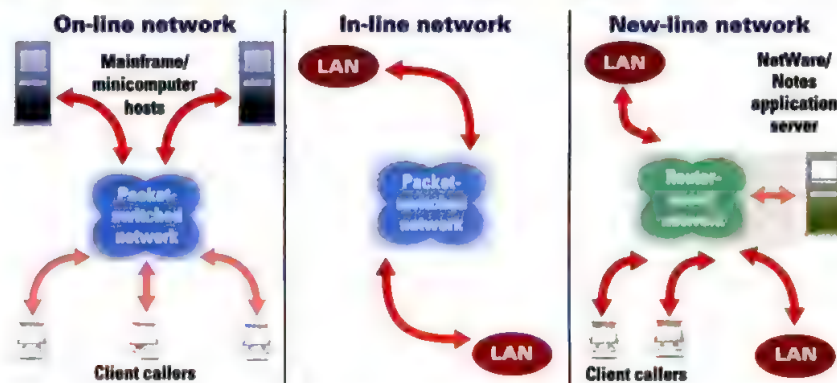
You can use AT&T's pipes to link to distant servers within your own organization or in companies you do business with, or to enter AT&T's services, such as NetWare and Notes

servers that AT&T manages and maintains. Because the network is based on IPX routing instead of more complex packet switches, costs should stay low with flexibility high.

With networkMCI Business, MCI includes significant new-line capabilities. MCI packages the MCI Mail

handle your e-mail. You receive one bill and have one place to call for expanded services or for support.

AT&T's new-line approach initially has a slightly narrower and more specialized focus on LAN services, but AT&T has the resources to match MCI's offerings. These two giants will



On-line networks use packet-switched connections to provide access to mainframe-type computers. In-line networks carry data between LANs and provide multipoint access. New-line networks use router or packet-switched connections to access Lotus Notes and NetWare servers and to provide flexible LAN-to-LAN links.

network with LAN-to-LAN connectivity, fax services, video conferencing, Internet access, and more.

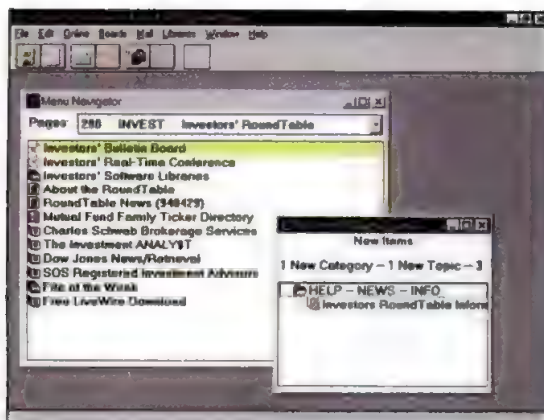
MCI emphasizes end-to-end service and networkMCI Business is available now. The company will order and manage your ISDN access, long-distance LAN-to-LAN links, and all other services. MCI will arrange for the service and equipment to link your LANs, conduct videoconferences, and

interact to create a new kind of service that is more integrated with your operation than today's services.

Existing companies can respond by becoming more highly specialized or more broadly generalized, but it will be hard to beat the spread of AT&T and MCI. One thing is certain—these two companies are fanning the winds of change around both on-line and in-line service vendors. □

NETWORKING

On-Line Services



GENIE's RoundTables provide you with professional forums, and more than 80 areas for hobbies and entertainment.

some of the other on-line services: GENIE's graphical elements do not come into play until you have completed your sign-on. And you're assigned a cryptic user ID and password at sign-on, which you should be sure to write down and change at the first opportunity. To its credit, the GENIE package includes a complete visual road map of all the services available with jump words and page numbers. (You can also access GENIE using Aladdin, a DOS-based front end that has more advanced off-line features. See "A Change of Face.")

Once you're logged on, the primary method of moving around GENIE in Windows is the Menu Navigator, a graphical element that shows the options for the area you're in. In the Navigator, you view a pull-down menu history of your current session and move backward and forward by double-clicking on the page description. You can also jump to locations using key words or page numbers through an option on the menu bar.

STICKEN SHOCK

Cost is a major consideration when you are accessing GENIE. The basic fee itself is not bad—\$8.95 per month, which includes 4 hours of free connect time (additional connect time is \$3 per hour). The real price shock comes with the surcharges for prime time—\$9.50 per hour (8:00 A.M. to 6:00 P.M., Monday through Friday)—and 9.6-Kbps connections at \$6 per hour. You can pay as much as \$18.50 per hour while connected. These are the most expensive timed charges of the on-line services in this review, and above these charges are additional charges for premium services such as Charles Schwab Brokerage Services and the OAG for travel.

Yet GENIE's real strength is its ability to function as a research and information repository. In addition to Schwab, OAG, and many others, GENIE gives you access to Businesswire, Dialog, Peterson's College

FACT FILE

GENIE

Requires: 8088-based PC or better, any communications software, modem. **In short:** GENIE's rich resources—a new interface, broad content coverage, and promised improvement of Internet access—may not make up for some extremely high connect charges. Cost is something to consider. Even though the basic fee is not high, surcharges for use during prime time, plus additional charges for premium services, can really add up. It's an alternative to CompuServe for the business user, but even its improved e-mail services and some great multiplayer games aren't enough to recommend it to the home user.

Against other services in this field.

GE Information Services Inc., 401 N. Washington St., Rockville, MD 20850, 800-638-9636, 301-251-6475; fax, 301-340-4433; e-mail, feedback@genie.geis.com.

464 on reader service card

SUITABILITY TO TASK

Installation and orientation	FAIR
Content	EXCELLENT
Interface	GOOD
E-mail	GOOD
Discussion groups and forums	GOOD
Internet connectivity	POOR



You can also access GENIE with Aladdin. Even though it is DOS-based, it offers more advanced off-line features.

Dead boring best described old George's graphics. Then he bought **Simply 3D**. His graphics sizzled. Logos flew. 3D effects? Drop dead gorgeous. George now wears black. Drives a Porsche. Is incredibly attractive to the opposite sex. Not bad for **59 bucks**.



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Database, and TRW corporate credit profiles, as well as a gateway to Dow Jones News/Retrieval. The high cost of actually using some of these services, however, suggests they are for business users with well-directed searches only, not the casual browser.

GEIE's content comes in three formats: roundtables (the equivalent of discussion forums), information databases, and chat areas. Participating vendors in the computer section include Borland, IBM, Microsoft, and WordPerfect. Hardware vendors are not nearly as well represented.

In addition to visiting professional forums in areas such as law, medicine, and real estate, you can go to more than 80 areas devoted to hobbies, entertainment, and other special interests. Although we found the participation levels in the roundtables fairly active, some areas are not updated as often as others. Furthermore, GEIE offers some great multiplayer games. And people looking for travel services will find Easysabre, as well as a wide range of travel roundtables.

The creation of e-mail in GEIE is substantially easier thanks to the greatly improved interface. GE also has added an address book. Aside from the per-hour charges, GEIE does not charge for e-mail or attachments. There's also an easy-to-use Internet mail option.

In keeping with the current rage, GEIE plans to add greater Internet access with FTP and Telnet features, as well as Usenet Newsgroup postings, gopher, and WAIS (Wide Area Information Server) services. As of this writing, though, e-mail was the only Internet service available.

GEIE maintains its content well enough to be a significant alternative to CompuServe as an information source for business users. The Windows interface and the soon-to-be-added Internet connectivity keep it in the race for your on-line dollars, but unless costs are reduced, its appeal seems limited to those doing serious research. There are better on-line choices for the home user.

Prodigy Services Co.

● Prodigy

BY SEAN GONZALEZ

This year's roundup finds Prodigy with the same cumbersome interface—but with the company preparing to release a dramatically improved version (promised in the first quarter of 1995). Even as is, Prodigy is a good choice for people who are new to personal computers, particularly children. It is well priced, at \$9.95 per month, which includes 5 hours of connect time; after that, it's \$2.95.

PRODIGO
SENDER PRIZE OVERNIGHT, BUT
UN, US Say End May Be Near For Besieged Bihac, Bosnia
NEW MULTIMEDIA MAGAZINE
New Newswatch Is Available Online
COMING TRIVIA, PEANUTS PRIZES
"A Charlie Brown Christmas" In CD
DECEMBER HOLIDAY BOARD GUESTS
Ask Bob Hope and Rosemary Clooney
EARN 1 Month FREE
VISIT THE NFL ONLINE FAN CLUB
Win Super Bowl Tix & Ufo for Pro Bowl
GIVE FREE KITS, FREE SHIPPING, TOO
HOME SHOPPING CLUB CHECK TO SCHEDULE, TALK TO SHOW HOSTS ON BB
Shop for Great Values; Supplies Are Limited

Prodigy has been criticized previously for its interface and some limitations in its service.

Installation wasn't as easy as it could have been. We were using a high-speed modem that supports ER/RC (extended result/response codes) and had difficulty connecting to Prodigy. Only after we used the ASSIST program and attempted to set up several times were we able to connect.

Prodigy's commitment to embrace new technologies overall is apparent. The company recently released its interfaces to Internet e-mail, Usenet Newsgroups, a World-Wide Web browser, and its separate Web service, AstraNet (<http://www.astranet.com>). The company is also committed to exploiting the wider bandwidth of cable technology in up-to-the-minute services. The new software that's coming is based on the same technology that's turning the Internet into a user-friendly environment. In 1995, Prodigy's interface could become the best

▶ FACT FILE

Prodigy

Requires: 386SX/16-based PC or better, 2.4/9.6-Kbps modem or higher, Microsoft Windows 3.1 or later **Recommended:** 4MB RAM, 5MB available hard-disk space **In short:** Prodigy has an extensive selection of both information and on-line services. And although this review found the service to have the same sluggish, inelegant interface, Prodigy should have its exciting new interface released in the first quarter of 1995. Prodigy's sports service, bulletin boards, and shopping areas are all first-rate. Furthermore, it's a particularly good on-line environment for children because many of its areas are geared to children and it has extensive monitoring for content.

SUITABILITY TO TASK

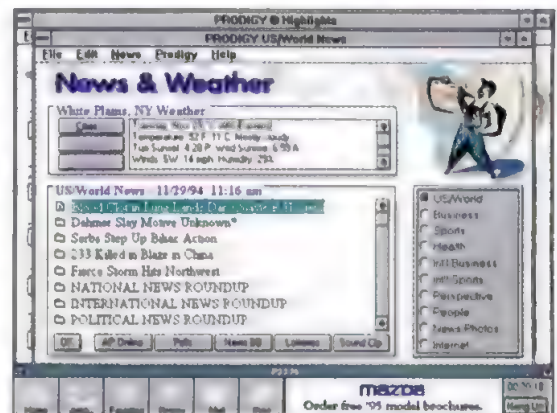
Installation and orientation	FAIR
Content	GOOD
Interface	FAIR
E-mail	FAIR
Discussion groups and forums	EXCELLENT
Internet connectivity	FAIR

Prodigy Services Co.,
445 Hamilton Ave.,
White Plains, NY
10601, 800-776-3449; no e-mail address.
465 on reader service card

that on-line services have to offer.

Although its Usenet Newsgroups' interface is better than America Online's, Prodigy's Internet services are not comparable. On Prodigy you cannot use gopher, WAIS, or FTP; and sending Internet mail requires using a separate dialog box if the address is longer than 40 characters. The recently announced—and heavily advertised—chat area is a bad copy of AOL's. Also, finding files on the system is easier on CompuServe.

Prodigy's sports coverage, bulletin boards, and on-line shopping area are second to none. Teaming up with ESPN,



Prodigy's new interface, above, represents a complete revamping of the system. It's a dramatically improved product.

Information Providers at a Glance

Service	Vendor	Subscription information	What you'll find
CDP Online	CDP Technologies	800-289-4277	About 160 databases, of which about 70 relate to biomedical fields
Dialog	Knight-Ridder Information Inc.	800-334-2564	The granddaddy of information vendors, with more than 450 databases covering nearly every subject imaginable. Through the company's recent acquisition of VU/Text, it now carries the full text of most U.S. newspapers
Dow Jones News/Retrieval	Dow Jones & Co. Inc.	800-522-3567	Access to about 70 separate databases, mostly concentrated in business topics and news, exclusive access to <i>The Wall Street Journal</i> in full text and other Dow Jones information sources
LEXIS-NEXIS	LEXIS-NEXIS	800-227-4908	LEXIS: more than 45 specialized law libraries, covering all areas of law practice. NEXIS: a full-text news service covering newspapers from around the country, news wires, magazines, and other sources
NewsNet	NewsNet	800-345-1301	The full text of more than 800 industry newsletters and news wires, covering more than 30 different industries and professions
Orbit Online Service	Questel-Orbit Inc.	800-456-7248	More than 100 databases concentrated in scientific and technical fields, the premier source for international patent information
Westlaw	West Publishing Co.	800-937-8529	Archives of federal and state law cases, regulations, statutes and codes, judicial and administrative decisions, and full text from a variety of legal publications
Wilsonline	H.W. Wilson Co.	800-367-6770	Access to familiar indexes, such as <i>The Readers' Guide to Periodical Literature</i> , in a variety of disciplines

Database provider, telephone (voice)	Content	Update frequency	Time frame covered	On-line service and database type							
				CDP Online	Dialog	Dow Jones	LEXIS-NEXIS	NewsNet	Orbit	Westlaw	Wilsonline

Access (CompuServe, Delphi, Dow Jones, or Prodigy)

General Reference

Biography Index H.W. Wilson Co. 800-367-6770	Index of biographical references in recent periodicals, novels, dramas, poetry, and letters	Semiweekly	July 1984-present								Bib
Biography Master Index Gale Research Inc. 313-961-2242	Biographical data including birth dates, death dates, and source-book references on more than 3 million people in myriad fields	Annually	B.C.-present		Dir						
Books in Print Reed Reference Publishing Co. 908-464-6800	Information on books that are currently published or in print in the United States	Monthly	Current	Dir	Dir						
Encyclopedia of Associations Gale Research Inc. 313-961-2242	Detailed information on more than 80,000 nonprofit membership organizations worldwide	Semiannually	Current		Dir						
Marquis Who's Who Reed Reference Publishing Co. 908-464-6800	Biographical information for more than 82,000 prominent individuals alive at publication time	Quarterly	Current		Dir						
Peterson's College Database Peterson's Guides 609-243-9111	A directory of colleges and universities in the U.S. and Canada	Annually	Current		Dir	Dir					
Quotations Database Knight-Ridder Information Inc. 800-334-2564	Full-text listing of literary quotations, political quotations, and other sayings of importance	Closed file	B.C.-1979		FT						
Standard & Poor's Register-Biographical Standard & Poor's Corp. 212-248-2525	Personal and professional background on more than 70,000 key business executives	Semiannually	Current		Dir		Dir				

News and Current Events

AP News Associated Press 212-621-1500	Full-text coverage of national, international, business, financial, and sports news from the Associated Press	Continually	1984-present		FT		FT	FT			
Business Wire Business Wire 415-986-4422	Full-text news from more than 10,000 sources, including government offices, universities, research institutes, political organizations, and companies	Continually	1986-present		FT	FT			FT		
Knight-Ridder/Tribune Business News Knight-Ridder Financial 212-269-1110	Unedited news concerning finance and business from the 28 newspapers of the Knight-Ridder organization	Continually	1989-present		FT					FT	
The Los Angeles Times Los Angeles Times 213-237-3000	Full-text coverage of <i>The Los Angeles Times</i>	Daily	1985-present		FT	FT	FT				
The New York Times The New York Times Co. 201-416-2000	Abstracts or full-text coverage of <i>The New York Times</i>	Daily	1980-present				Bib	FT			
PR Newswire PR Newswire Association Inc. 212-832-9400	Complete text of the news released by various companies, public relations offices, trade associations, and government agencies	Continually	May 1987-present		FT					FT	

Bib—bibliographic index or abstracts, Dir—directory, FT—full text, Num—numeric.

Database, provider, telephone (voice)	Content	Update frequency	Time frame covered	On-line service and database type							
				GDP Online	Dialog	Dow Jones DE, DJ PR	LEXIS-NEXIS PR	NewsNet CS	Orion CS	Westlaw DE	Wisenline
Access (CompuServe, Delphi, Dow Jones, or Prodigy):					CS, DE						
Reuters Reuters U.S. Inc. 800-435-0101	Unedited news releases from the <i>Reuters Business Report</i> and the complete array of Reuters Library Service news wires	Continually	1987-present		FT						
The Wall Street Journal Dow Jones & Co. Inc. 800-522-3567	Full-text coverage of <i>The Wall Street Journal</i>	Daily	1984-present			FT					
The Washington Post The Washington Post News Library 202-334-6000	Complete text of selected articles from <i>The Washington Post</i>	Daily	1984-present		FT	FT	FT				
Periodicals											
Academic Index Information Access Co. 415-378-5000	Indexes a variety of academic and general-interest periodicals	Monthly	1976-present		Bib, FT						
Computer Database Information Access Co. 415-378-5000	References and abstracts for periodicals dealing with computers, electronics, and telecommunications	Weekly	1983-present		Bib, FT						
Magazine Index Information Access Co. 415-378-5000	References more than 500 well-known magazines on current events, the arts, sports, business, technology, and other topics	Weekly	1959-1970, 1973-present		Bib						
McGraw-Hill Publications Library McGraw-Hill Information Services Co. 609-426-5000	Complete text of articles from the industry publications of McGraw-Hill	Weekly	1985-present		FT	FT	FT				
National Newspaper Index Information Access Co. 415-378-5000	Index of <i>The Christian Science Monitor</i> , <i>The New York Times</i> , <i>The Wall Street Journal</i> , and other newspapers	Monthly	1979-present		Bib						
Newspaper & Periodical Abstracts UMI/Data Courier 502-583-4111	Citations and abstracts of more than 1,500 periodicals and more than 80 television and radio programs	Daily	1988-present		Bib						
PTS Newsletter Database Information Access Co. 415-378-5000	Full-text articles from more than 500 important newsletters published worldwide covering many industries and subject areas	Daily	1988-present		FT						
Reader's Guide to Periodical Literature H.W. Wilson Co. 800-367-6770	Exhaustive index to almost all English-language periodicals published in the U.S. and Canada	Semiweekly	1983-present								Bib
Business Information											
ABI/Inform UMI/Data Courier 502-583-4111	Bibliographic and selected full-text coverage of more than 1,000 business publications	Weekly	August 1971-present	Bib, FT	Bib, FT		Bib, FT		Bib, FT		
Business Dateline UMI/Data Courier 502-583-4111	Full-text articles appearing in more than 350 regional business publications from the U.S. and Canada	Weekly	1985-present		FT	FT	FT				
Disclosure Database Disclosure Inc. 301-951-1300	Detailed financial reports on more than 12,000 companies publicly traded in the U.S., data based on SEC reports and other documents	Weekly	Current		Dir, Num	Dir, Num	Dir, Num				
Dow Jones Enhanced Current Quotes Dow Jones & Co. Inc. 800-522-3567	Quotes on common and preferred stock, corporate and foreign bonds, mutual funds, options, and U.S. Treasury issues	Continually	Current			FT Num					
Dow Jones Historical Quotes Dow Jones & Co. Inc. 800-522-3567	Daily quotes, monthly summaries, and quarterly summaries on common and preferred stocks from the past	Daily	1978-present			Num					
Dow Jones News Dow Jones & Co. Inc. 800-522-3567	A variety of news from <i>Barron's</i> , <i>The Wall Street Journal</i> , and the Dow Jones News Service	Continually	June 1979-present			FT					
Dow Jones QuickSearch Dow Jones & Co. Inc. 800-522-3567	Company information in various categories: current stock quotes, financial overviews, income statements, company vs. industry performance, latest news, and more	Continually	Current			Dir, Num					
Dun's Financial Records Plus Dun & Bradstreet Information Services 908-665-5000	Comprehensive financial reports and histories of more than 650,000 public and private companies	Quarterly	Current		Dir, Num	Dir, Num					
Investext Thomson Financial Services 617-345-2000	Full-text financial and market reports written by industry analysts from investment banks and financial research organizations	Daily	1982-present		FT	FT	FT	FT			
Moody's Corporate Profiles Moody's Investors Service Inc. 212-553-0300	Descriptions and financial data for the top publicly traded companies in the U.S.	Weekly	Current		Dir, Num						
PTS PROMT Information Access Co. 415-378-5000	Abstracts and full text of articles covering companies, products, technology, and marketing news for all major industries	Daily	1972-present		Bib, FT						
Bib—bibliographic index or abstracts, Dir—directory, FT—full text, Num—numeric											

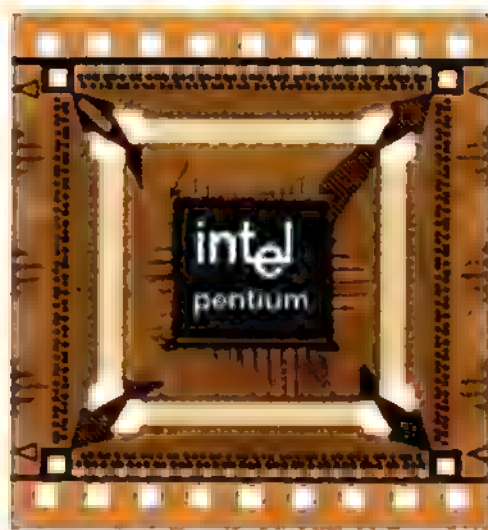
NETWORKING

On-Line Services

Database provider, telephone (voice)	Content	Update frequency	Time frame covered	On-line service and database type							
				CDP Online	Dialing	On-line Jones	LEXIS-NEXIS	ResearchNet	Orbit	Vantage	Wilmington
Access (CompuServe, Delphi, Dow Jones, or Prodigy):					CS, DE	DE, DJ PR	PR	CS	CS	DE	
SEC Online SEC Online Inc. 516-864-7200	Full-text coverage of annual reports, 10Ks, 10Qs, 20FTs, and proxy filings for more than 5,600 companies, all listed on the NYSE, Amex, or NASDAQ exchange	Weekly	July 1987-present		FT	FT	FT				
Standard & Poor's Corporate Descriptions Standard & Poor's Corp. 212-248-2525	Company background, financial histories, and news on more than 9 000 publicly owned companies	Semi-monthly	Current		Dir, Num		Dir, Num	Dir, Num			
Trade & Industry ASAP Information Access Co. 415-378-5000	Complete text from more than 560 industry journals covered in the Trade & Industry Index	Weekly	1983-present		FT		FT				
Trade & Industry Index Information Access Co. 415-378-5000	Comprehensive indexing and some abstracts from more than 300 trade and industry journals, selective indexing of 12,000 publications	Weekly	1981-present		Bib						
Wilson Business Index, Wilson Business Abstracts H.W. Wilson Co. 800-367-6770	Indexes national and international business information from 350 English-language business magazines, with accompanying abstracts	Daily	July 1982-present							Bib	
Science and Technology											
Applied Science & Technology Index H.W. Wilson Co. 800-367-6770	Indexes English-language periodicals focusing on science and technology	Semi-weekly	October 1983-present							Bib	
Chemical Abstracts Chemical Abstracts Service, American Chemical Society 614-447-3600	A broad range of chemical science literature including journals, patents, recent books, conference papers, and government research reports	Quarterly	1830-present		Bib				Bib		
Ei Compindex*Plus Ei (Engineering Information Inc.) 212-705-7000	Information on various disciplines of engineering, from marine to chemical to electrical to nuclear	Weekly	1970-present	Bib	Bib				Bib		
General Science Index H.W. Wilson Co. 800-367-6770	References English-language periodicals on astronomy, biology, botany, chemistry, mathematics, physics, and other fields	Semi-weekly	May 1984-present							Bib	
Health Periodicals Database Information Access Co. 415-378-5000	Index for and some full-text articles from various periodicals on health issues	Weekly	1988-present	Bib, FT	Bib, FT						
INSPEC Institution of Electrical Engineers, United Kingdom 0438 313311	More than 4 million records covering international literature on physics, electronics, and computer technology	Weekly	1969-present	Bib	Bib				Bib		
MEDIS LEXIS-NEXIS 800-227-4908	Complete text of various journals, textbooks, and other databases dealing with all areas of medicine	Varies depending on publication	Varies depending on publication				Bib				
Medline U.S. National Library of Medicine 301-496-6193	Combines the printed referencing of <i>Index Medicus</i> , the <i>Index of Dental Literature</i> , and the <i>International Nursing Index</i> ; provides information covering the biomedical field	Weekly	1966-present	Bib	Bib						
SciSearch Institute for Scientific Information 215-386-0100	Indexes science and technology publications; provides all the records from the Science Citation Index and the Current Contents Series	Weekly	1974-present		Bib				Bib		
Social Sciences											
PAIS International Public Affairs Information Service 212-736-6629	A bibliographic index of public policy publications in business, economics, law, finance, government, political science, and related fields	Monthly	1976-present		Bib						
Social Sciences Abstracts H.W. Wilson Co. 800-367-6770	Abstracts of articles in social science periodicals; a companion service to H.W. Wilson's Social Sciences Index	Semi-weekly	January 1994-present							Bib	
Social Sciences Index H.W. Wilson Co. 800-367-6770	An index to all English-language social science periodicals dealing with anthropology, Black studies, economics, political science, sociology, urban studies, and related fields	Semi-weekly	February 1983-present							Bib	
Social SciSearch Institute for Scientific Information 215-386-0100	Indexes 1,500 international social science periodicals and 3,000 other periodicals on the physical, natural, and biomedical sciences	Weekly	1972-present	Bib	Bib						
Statistics and Demographics											
ASI (American Statistics Index) Congressional Information Service Inc. 301-654-1550	An index of statistical literature published by more than 500 U.S. federal offices and regional offices, includes accompanying abstracts	Monthly	1974-present		Bib						
CENDATA U.S. Bureau of the Census 301-457-1214	Selected statistical data from the U.S. Census Bureau and U.S. Dept. of Commerce; includes demographic data from the 1990 Census	Daily	Current		FT						

Bib—bibliographic index or abstracts, Dir—directory, FT—full text, Num—numeric

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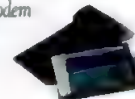


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NETWORKING

On-Line Services

Database, provider, telephone (voice)	Content	Update frequency	Time frame covered	On-line service and database type						
				CDP Online	Dialog	Dow Jones	LEXIS- NEXIS	NewsNet	Orion	Westlaw
Access (CompuServe, Delphi, Dow Jones, or Prodigy):					CS, DE PR	DE, DJ PR		CS	CS	DE
D&B—Donnelley Demographics Donnelley Information Marketing Services 203-353-7000	Demographic information from the 1980 Census, parts of the 1990 Census, and projections from Donnelley Marketing Information Services	Annually	Current		Num					
Government										
Congressional Activities Oliphant Washington Service 202-298-7226	Data on congressional events, including a schedule of hearings, bills introduced, reports filed, laws enacted, and measures passed	Weekly	March 1984— present					FT		
Congressional Record Abstracts National Institute of Standards and Technologies 301-975-2000	Abstracts taken from issues of the <i>Congressional Record</i> , the official journal of the proceedings of the U.S. Congress	Weekly	1981—present		Bib					Bib
Federal News Service Federal Information Systems Corp. 202-347-1400	Transcripts of all federal-government press conferences, speeches, and interviews	Daily	August 1991— present		FT		FT			FT
GPO Monthly Catalog U.S. Government Printing Office 202-512-1800	Reports, studies, handbooks, conference proceedings, and other publications distributed by U.S. government agencies and Congress	Monthly	July 1976— present		Bib					Bib
GPO Publications Reference File U.S. Government Printing Office 202-512-1800	An index of all public literature on sale through the Superintendent of Documents and the U.S. Government Printing Office, in addition to future or out-of-print literature developed by the legislative and executive branches of the U.S. government	Biweekly	1971—present		Bib					Bib
NTIS National Technical Information Service 703-487-4650	Research, development, engineering, and analysis sponsored by the U.S. government, federal agencies, and various federal contractors or grantees	Biweekly	1964—present	Bib	Bib				Bib	Bib
Law										
Index to Legal Periodicals H.W. Wilson Co. 800-367-6770	An index to the best-known English-language legal publications	Semiweekly	August 1981— present				Bib			Bib
LEXIS LEXIS-NEXIS 800-227-4908	More than 45 specialized law libraries, covering all areas of law practice including securities, taxation, banking, environmental law, energy, and international law	Varies depending on library	Varies depending on library				Bib, FT			
Martindale-Hubbell Law Directory Reed Reference Publishing Co. 908-464-6800	The complete text of the printed <i>Martindale-Hubbell Law Directory</i> with more than 800,000 national and international attorney listings	Annually	Current				Dir			
Westlaw West Publishing 800-937-8529	Access to complete legislative libraries, covering both federal and state statutes, codes, regulations, and rules, as well as judicial and administrative decisions	Varies depending on library	Varies depending on library							Bib, FT
Patents										
CLAIMS (Class Assignee Index Method Search) IFT/Plenum Dirata Corp. 910-392-0068	Three separate databases that list more than 2.3 million U.S. patents issued by the U.S. Patent and Trademark Office	Weekly	1950—present		Bib				Bib	
LEXPAT LEXIS-NEXIS 800-227-4908	Full-text coverage of all utility patents issued by the U.S. Patent and Trademark Office since 1975, all plant and design patents issued since December 1976	Weekly	1975—present				FT			
Patent Status File Rapid Patent Service 703-413-5050	Lists a score of post-issue actions that affect U.S. patents dating back to 1973	Monthly	1973—present						FT	
Trademarkscan-U.S. Thomson & Thomson 617-479-1600	Lists all trademarks and service marks issued by or applied for at the U.S. Patent and Trademark Office	Biweekly	1884—present		Dir					
U.S. Copyrights U.S. Copyright Office 202-707-3000	Details on all active copyright and mask-work registrations filed at the U.S. Copyright Office	Weekly	1978—present		Dir					
U.S. Patent Fulltext U.S. Patent and Trademark Office 703-557-4636	Full-text coverage of U.S. patents issued by the U.S. Patent and Trademark Office	Weekly	1971—present		FT					
U.S. Patents Derwent Inc. 703-790-0400	Extensive patent data, with complete front-page information and claims on all U.S. patents issued from 1971 to the present	Weekly	1971—present						Bib, FT	

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Routes to the Net

If it's the Internet you're after, one of these Internet providers may deliver a more direct route. Some are beginning to provide graphical interfaces to their services.

By Sean Gonzalez

For years the Internet was a barren, elitist, members-only camp for techno-geeks, computer hackers, and university researchers. Now, thanks to the amazing work of this strange breed of computer scientist, the Internet is becoming a reality for the average user. The recent introduction of graphical interfaces for the legendary, yet cryptic, Internet tools allows any user to tap into the power of the Internet.

Now that anyone can use the Internet, how do you access it? What you need is a new type of utility company—an Internet provider. Such services are smaller in reach and range than the large commercial services in our main roundup, but they could be just the service you need.

An Internet provider is a company that maintains hardware and software to connect a network of computers to the Internet. Its role is to ensure that the end user—you, a company, a university, or even other Internet providers—has a reliable connection to the Internet. (See "Making the Internet Connection," October 11, 1994, for a roundup of Internet front ends and an explanation of terms.)

Because it is relatively easy to become an Internet provider, differentiating between large and small providers is not obvious. Armed with a few telephone lines and modems, a PC with networking hardware and software, and a connection to the Internet, anyone can become an Internet provider. Many have done just that.

Whether it's large or small, the absolute minimum you should expect from your Internet provider is that your connection to the Internet is a

phone call away. Beyond supplying the physical link to the Internet, some Internet providers offer different connection options: They have value-added services that may be what you're looking for.

In this sampling, we focused on Internet providers that have experience catering to individuals. Within this group we identified three major types of connectivity options: shell

*Pricing and
accessibility are likely
to be the influential
factors in your
choice of an
Internet provider.*

accounts (with and without assistant menus), SLIP/PPP, and GUIs. Each provider may offer more than one of these options. (Also see our directory of Internet Service Providers in the Winter 1994 issue of the PC Magazine CD.)

BEST OF THE BREED

The most important qualities of an Internet provider are the speed and reliability of the link, any value-added services (help menus, tutorials, GUIs), pricing, and accessibility. All the providers reviewed here offer fast and reliable links to the Internet, and most of them have good value-added services that facilitate access. Thus, pricing and accessibility most likely will be

the influential factors in your selection.

Expect to pay an average monthly fee of \$17.50 for your connection, plus \$3.00 per hour of connect time. Accessibility also affects pricing. If your Internet provider cannot be reached via a local phone call, you may end up incurring long-distance surcharges. To address this problem many providers use third-party network-access companies (such as SprintNet and CompuServe's Packet Network) to offer cost-effective access options.

Although good technical support will be most important to businesses and individuals who absolutely depend on their Internet connectivity, it is good to know there is a helping hand a phone call or an e-mail away. All the providers here offer good technical support, but the best are AlterNet and NETCOM.

WHERE ON-LINE SERVICES FIT

Although not commonly thought of as Internet providers, commercial on-line services are beginning to offer more Internet connectivity. In the main roundup here (and in "Services for Connecting," October 11, 1994), we reviewed the Internet capabilities of on-line services.

Although on-line services have done a good job of bringing Internet access to the average computer user, many have done a bad job of implementing their Internet-access tools. It is probably the competitive nature of the business that has caused on-line services to stampede to have a presence on the Internet. Unfortunately, many have done so by stampeding over their own customers.

On-line-service customers get frustrated by the overwhelming amount of information that is presented to them, and Internet users get frustrated by on-line service customers' improper use of News. This is a transition that both sides will go through for some time.

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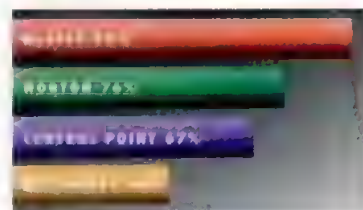
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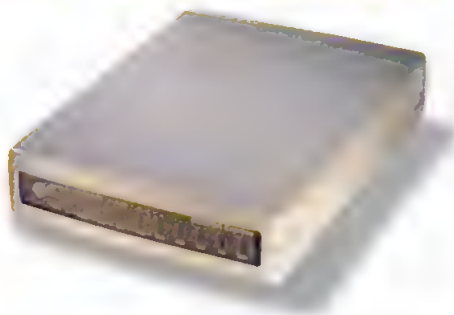
VirusScan consistently detects far more viruses than any other competitor. Virus Information Summary Listing (VSIUM) 12/94

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More Routes to the Net

SHELL-ACCOUNT PROVIDERS

Of all the Internet connectivity options, shell accounts are the simplest but the least user-friendly. You can access your shell account from any type of terminal, however, including public ones and PCs.

Unless the Internet provider offers help menus, you will need to learn Unix commands to use shell accounts and run Internet tools. If you're not a moderately sophisticated computer user, consider other connectivity options to spare yourself a lot of frustration.

All Internet providers we reviewed offer on-line manuals for helping you figure out how to use their systems to access the Internet. Some have innovative help systems or on-line tours to show you how to use the available system tools and resources. The easiest systems to use are those that offer robust help menus.

CERFNET

Users of CERFnet will appreciate the Internet Compass, a help menu for navigating the system, and the gopher-based help system. By using the help system to access the very useful and well-organized system information, you also will learn how to use the gopher tool itself.

The Internet Compass menus ask you for information needed to run the available Internet tools, so getting to the tools is as simple as following these well-organized menus. A lot of help screens are missing, though, so help is not always available through the menus.

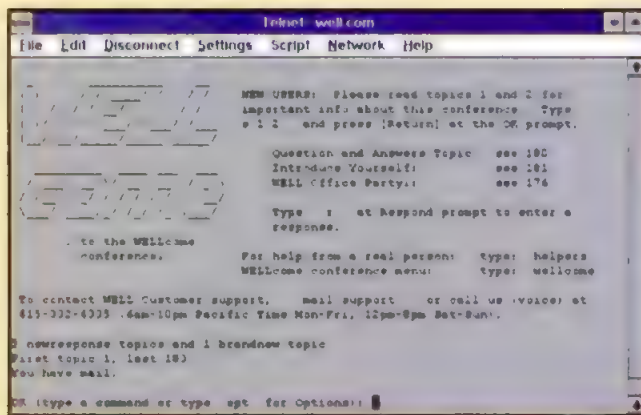
CERFnet; sales@cerf.net; 800-876-2373.

DIGEX

The DIGEX help system gives you information about all the functions available on-line. There are documents that

list interesting ftp, telnet, gopher, and IRC sites, with instructions to help you access them. Accessing an Internet tool is as easy as typing the tool name at the command prompt (such as telnet or gopher). Unfortunately, once you access the tool, you are limited to its help, and that is sometimes scarce. The printed manual we received from DIGEX was a great help. It contains the information you need to use the system utilities.

Digital Express Group Inc.;
info@digex.net; 800-969-9090.



Even though the WELL is text-based, it offers new users a tour of its system, which includes over 200 conferences.

NETCOM

This provider has a great help menu that serves as a gateway to many Internet tools available on-line, and provides useful system-related information. Help is always available, and—thanks to the included utilities—managing your account is easy as well. For example, deleting a file in a subdirectory is as simple as using the arrow keys to locate the file and pressing R(emove).

From the menu you can also access NETCOM's FAQs (frequently asked questions). The FAQs are complete and easy to search; it's like having technical support staff with you all the time. Furthermore, while all providers we reviewed offer technical support, NETCOM is the only one with a 24-hour help line. If help is not available on-line, it is always just a phone call away.

NETCOM On-Line Communication Services Inc.; info@netcom.com; 800-353-6600.

PANIX

When you log on to PANIX, you see a menu with options to execute common system tasks such as accessing e-mail, News, and system help files, or managing your files. The menu also allows you to run Unix commands by pressing a single choice—you don't have to learn the commands. Experienced

users can activate a Unix shell, then return to the menu. PANIX offers on-line technical support.

PANIX Public Access Networks Corp.;
info@panix.com; 212-741-4400.

THE PIPELINE

Although The Pipeline is best known for its superior GUI connectivity (discussed below), you can also use your account as a shell account. Upon log-on you are presented with The Pipeline

menu, a help menu that resembles the GUI version of The Pipeline.

Like its GUI counterpart, using The Pipeline as a shell account is a breeze. The help menus are some of the best available. Using Internet services from the menus is as easy as answering a few simple questions. It is hard to believe The Pipeline could have done any better (short of figuring out how to make the shell accounts look as sharp as the GUI) with its shell-account interface.

The Pipeline Network Inc.;
info@pipeline.com; 212-267-3636.

THE WELL

Don't think of The WELL as just another Internet gateway. Rich in content, it has more than 200 conferences on nearly every topic imaginable. When you connect for the first

More Routes to the Net

time, you can take a very worthwhile automated tour of the system.

As with DIGEX, you access Internet tools by typing each tool name. From that point on, you're on your own with The WELL's Unix-like tools. Should you have any questions, however, refer to the on-line conferences. Answers to all your questions most likely are already posted and readily available in the conferences.

The WELL; info@well.com; 415-332-4335.

THE WORLD

Dropping into The World was a rude awakening. This is the type of system that non-computerphiles want to avoid. Fortunately, the help command reveals a wealth of useful information, and the Internet help section is well-organized and complete. So, as long as you can recover from the shock of running into a system prompt immediately after log-on, you should be ready to go after you read the help files. (Software Tool & Die plans to create a graphical interface.)

Compared with all other service providers, The World is the least

expensive one for occasional use.

Software Tool & Die (The World); info@world.std.com; 617-739-0202.

SLIP/PPP PROVIDERS

CERFnet, DIGEX, and The Pipeline—reviewed above—as well as AlterNet, offer SLIP (Serial Line Interface Protocol) and PPP (Point-to-Point Protocol) connectivity. We found that this connectivity is very reliable and, if you use high-speed modems, delivers a fast interface for Internet tools by making your PC a TCP/IP host.

To use SLIP/PPP, you need additional software that provides a "TCP/IP stack." We recently reviewed TCP/IP stacks in "Tools for Connecting" (October 11, 1994). Most TCP/IP packages include GUI tools to access Internet resources, so you'll never have to learn a single Unix command, use help menus, or go through tutorials to start enjoying the Internet.

Even if your Internet provider does not offer SLIP/PPP support, you still may be able to use this type of connectivity. An innovative new \$25 product called The Internet Adapter (TIA),

developed by Cyberspace Development Inc. and marketed by InterMind Corp. (206-545-7803), can be added on. TIA is software that you run from your Unix shell account, which converts it into a "pseudo-SLIP" connection. The companies currently are working on a PPP version. (For information on obtaining a trial version of TIA, send mail to tia-single@marketplace.com.)

ALTERNET

If you want a provider that specializes in reliable SLIP/PPP connectivity, consider AlterNet. UUNET's support staff keeps users well informed about system downtimes and network problems.

UUNET Technologies Inc.; info@uunet.uu.net; 800-488-6384.

GUI PROVIDERS

Wouldn't it be nice if you could just click on a desktop icon to access the Internet and not worry about shell accounts, Unix commands, or purchasing a TCP/IP package? You can. NetCruiser and The Pipeline offer GUI interfaces that will enable the most Internet-shy user to enjoy it. These tools combine

Internet Service Providers: Cost Comparison

Services listed in alphabetical order

	AlterNet	CERFnet	DIGEX	NetCom	PANIX ①	The Pipeline ②	The WELL ③	The World ④
Setup fee	\$25	\$50	\$20	\$30	\$40 (Internet Service shell account)	None	None	None
GUI setup fee	N/A	N/A	N/A	\$25 (NetCruiser)	N/A	None	N/A	N/A
Monthly fees								
Shell account	N/A	\$20.00	\$25.00	\$17.50	Basic service, \$10.00; Internet service, \$19.00	\$20.00	\$15.00	\$5.00
SLIP or PPP account	\$25	\$20	\$35	N/A	\$35	\$20	N/A	N/A
GUI	N/A	N/A	N/A	\$19.95 (NetCruiser)	N/A	None	N/A	N/A
Prime-time fee (per hour)	Local number, \$3; 800 number, \$9	Local number, \$5; 800 number, \$10	\$1	Shell: none; NetCruiser after 40 hours, \$4	None	Shell after 20 hours, \$2; SLIP/PPP \$2	\$2	\$2
Non-prime-time fee (per hour)	Local number, \$3; 800 number, \$9	Local number, \$3; 800 number, \$8	\$1	None	None	Shell after 20 hours, \$2; SLIP/PPP \$2	\$2	\$2
Free access	None	None	6 hours per day	Shell unlimited; NetCruiser during prime time, 40 hours per month	Basic service only 2 weeks	Non-SLIP/PPP 20 hours per month	5 hours	1 hour

N/A—Not applicable. The service does not offer this feature.

① Direct-access numbers are available for the 212 and 516 area codes only. Basic service includes e-mail, news, and local PANIX access.

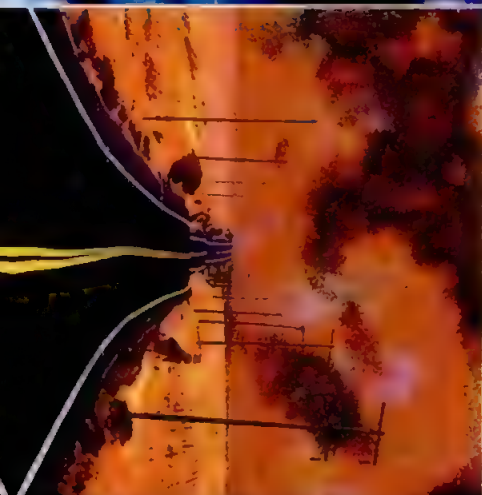
② There is a surcharge of \$5.00 per hour (prime time) and \$2.50 per hour (non-prime time) for SprintNet in the continental U.S. outside the 212, 516, and 914 area codes.

③ There is a surcharge of \$4.00 per hour for CompuServe Packet Network (CPN) in the continental U.S. outside the 415 area code.

④ Direct-access numbers are available in the 508 and 617 area codes only.



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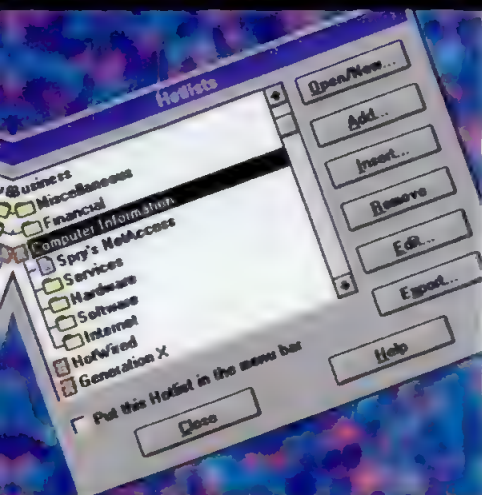
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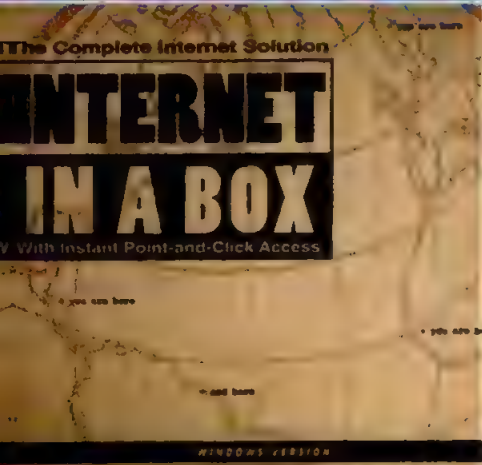
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A choice of models featuring either the **Intel® DX4/75MHz or DX4/100MHz processor**. Integrated math coprocessor is standard.

Amid the comfortable full-size keys on the new models is nestled the **new TrackPoint III™** with enhanced "Quick Stop" capability. Say goodbye to messy clip-ons and greasy trackballs.

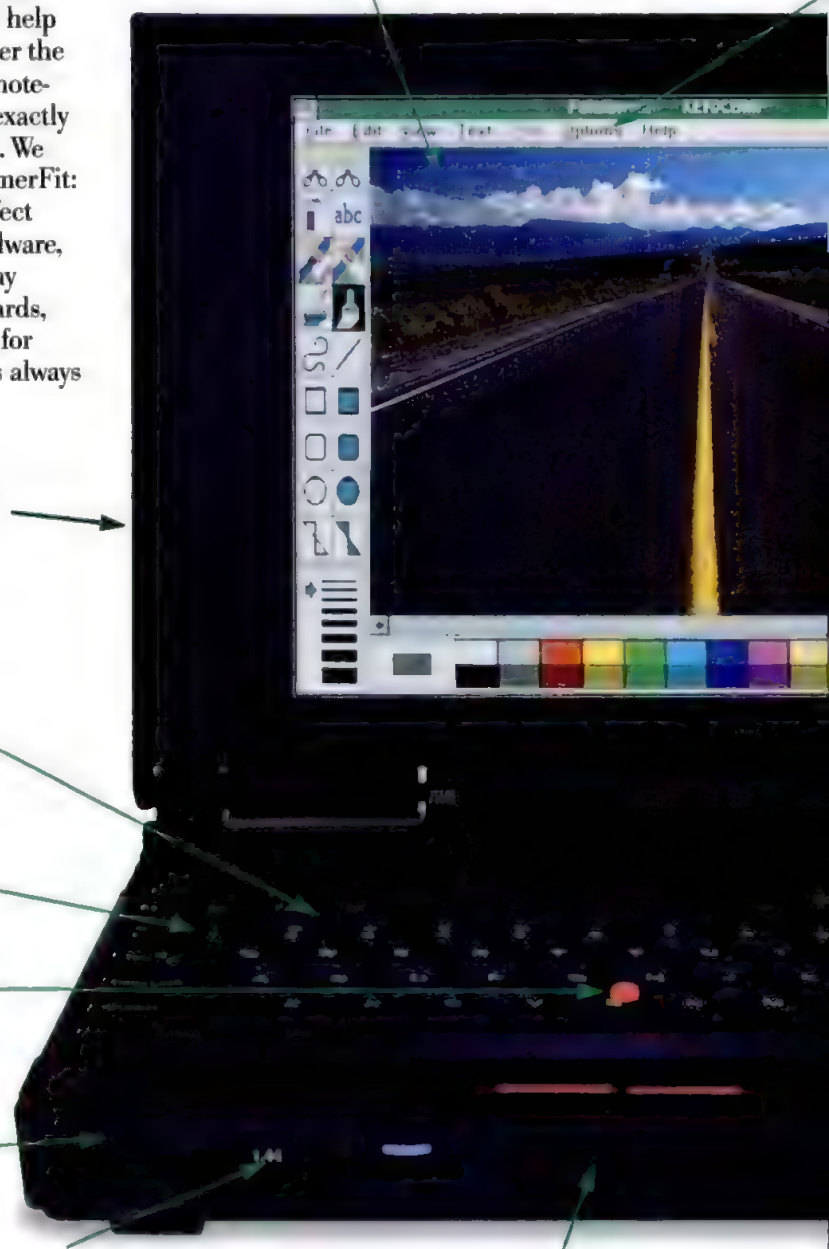
An IBM exclusive. The ThinkPad 755 uses **parity memory**. That means it tells you if there is a data error. If your data is mission critical, this is a must.



Transferring and synchronizing files and data has never been easier. The new ThinkPad 755 models come with **integrated infrared capability**. That makes wireless communications with other notebooks and desktops both quick and reliable.

Snap-out "**hot swap**" battery lets you change power on the fly. Without shutting down.

Start with the **acclaimed 10.4" (measured diagonally) color display**. Models available in TFT active matrix, dual scan, or the new glare-resistant black matrix on array TFT color screens.



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Instant productivity. A host of **very useful software** applications like Lotus® Organizer™ and SofNet FaxWorks™ come preloaded along with IBM DOS 6.3 and Windows™ 3.1. Access E-mail, build presentations, conduct remote access PC-to-PC sessions. It's all here.



Shown: the ThinkPad 755CE. Assembled in the U.S. and Japan.

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Dual scan color. Featuring the integrated Mwave Digital Signal Processor (DSP) with voice, fax and data capability For more performance - Intel 486DX4/100MHz processor 8MB RAM (expandable to 40MB) 340MB* HD (upgradable to 810MB) Better communications - Integrated Mwave DSP subsystem provides 14.4 data/fax modem - Mwave telephony includes telephone, full duplex speakerphone, answering machine - Full function audio support - Microphone/headphone jacks/integrated speaker - Infrared communications Convenient to operate - Weights just 6.4 pounds - Battery life: 3-10 hrs. - New TrackPoint III	Black matrix on array TFT color. Featuring the integrated Mwave DSP with voice, fax and data capability For more performance - Intel 486DX4/100MHz processor 8MB RAM (expandable to 40MB) 340MB* HD (upgradable to 810MB) Better communications - Integrated Mwave DSP subsystem provides 14.4 data/fax modem - Mwave telephony includes telephone, full duplex speakerphone, answering machine - Full function audio support - Microphone/headphone jacks/integrated speaker - Infrared communications Convenient to operate - Weights just 6.4 pounds - Battery life: 3-10 hrs - New TrackPoint III	Black matrix on array TFT color. Featuring an internal, snap-out, double-speed CD-ROM, integrated multimedia and the integrated Mwave DSP For more performance - Intel 486DX4/100MHz processor 8MB RAM (expandable to 40MB) 540MB* HD (upgradable to 810MB) Better communications - Integrated DSP Mwave subsystem provides 14.4 data/fax modem - Mwave telephony includes telephone, full duplex speakerphone, answering machine - Full function audio support - Microphone/headphone jacks/stereo speakers - Infrared communications Convenient to operate - Weights just 7.3 pounds - Battery life: 3-9 hrs - New TrackPoint III
\$4899 IBM Credit Lease \$174/month ¹	\$6249 IBM Credit Lease \$221/month ¹	\$7599 IBM Credit Lease \$269/month ¹
STANDARD ON EVERY THINKPAD 755 NOTEBOOK		
- Features a 10.4" (measured diagonally) screen - Local bus video with 1MB video memory - Math coprocessor 16KB internal cache 3-year warranty with International Warranty Service⁴ - ThinkPad EasyServ™³ and 24-hour HelpCenter® with IBM Online Housecall during warranty - Personalized nameplate		- Hundreds of dollars worth of preloaded business software - Advanced power management features - PCMCIA support for one Type III or two Type II or Type I devices 3.5" 1.44MB diskette drive - Rechargeable NiMH battery and AC adapter

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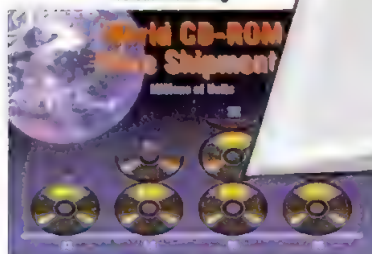
CorelDRAW 5—"the best has gotten better!"

InfoWorld, August 1994-USA

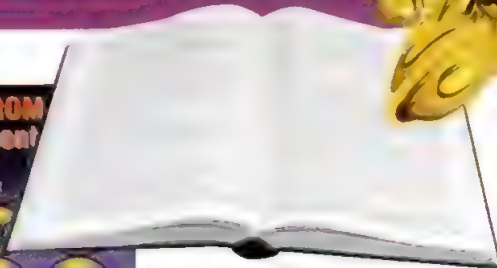
"OUTSTANDING! CorelDRAW 5 really is the best graphics package ever!"

PC Answers, June 1994-U.K.

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More Routes to the Net

the power of a SLIP/PPP connection, a TCP/IP package, and GUI interfaces into a simple-to-use desktop environment that puts all Internet resources just a mouse click away.

NETCRUISER

You can buy just the NetCruiser software or the NetCruiser Plus package. NetCruiser Plus includes the setup fee, first month's service fee, and two Internet books.

With the overwhelming amount of services available on the Internet, a common problem for newcomers is not knowing where to go once they're on the Net. NetCruiser offers a map of the United States (the Internet Site Chooser), from which you can select public-access ftp, gopher, or telnet sites by state.

You can also select these sites from a pull-down menu. Although it's a small list, it gives you the chance to get your feet wet without previous Internet experience.

We were disappointed to see that NetCruiser is still riddled with bugs and some of the tools, like the newsreader, are a bit simplistic. NetCruiser is extremely easy to use, however, and its intuitive tools will let you access all the must-see Internet resources.

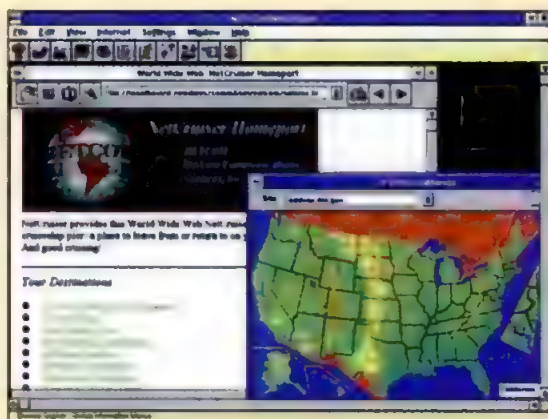
NETCOM On-Line Communication Services Inc.; info@netcom.com; 800-353-6600.

THE PIPELINE

This provider takes NetCruiser's approach to easy Internet navigation a step further with its wealth of search tools, front ends to popular Internet resources, and value-added services. It's not just one of the best Internet gateways available, but a great personal-use and business-research tool. The Pipeline is freeware, so you can either

download it or have it shipped to you.

On The Pipeline you can easily find virtually any information, from Amtrak's train schedules to book excerpts to weather maps to the latest from the AP. The Pipeline is a hybrid of an on-line service and an Internet provider—a must-have gateway to electronic information resources.



You can use NetCruiser's navigation map to get to where you want to go—just by selecting sites from a menu.

Thanks to its proprietary, prioritized packet-transfer protocol, Pink Slip, you will never have to wait for your computer to "stop thinking." You can start a long file transfer and read News or browse a gopher server, all at the same time. If you access The Pipeline from outside the New York area (area codes other than 212, 516, or 914), however, you will dial-in via SprintNet (and incur a surcharge of \$5.00 per hour for prime-time access and \$2.50 during off-hours). Pink Slip and The Pipeline's efficiency ensure that you get the most out of your connect-time charges.

The Pipeline has graphical interfaces for most Internet resources, but notoriously missing is a GUI World-Wide Web browser. A text-based browser called lynx is available. The Pipeline will soon release its GUI Web browser, making it a complete GUI Internet access tool.

The Pipeline Network Inc.; info@pipeline.com; 212-267-3636.□

Prodigy offers up-to-the-minute information on games in progress. Using cable technology, Prodigy will be able to deliver, on-demand, video clips of an on-going baseball game to your PC.

This service also has an extensive selection of more than 1,000 bulletin boards rich with useful, current information. And it's the place to meet celebrities in your fields of interest, from well-known financial advisors to actors.

Paying for on-line time and any premium services aren't the only ways to spend money while on-line. Prodigy's electronic shopping mall is remarkable. The service continues to use the lower portion of your screen to advertise its services and products you can purchase on-line.

Prodigy is now deploying 14.4-Kbps modem support, a welcome addition. In addition, Prodigy can update the software on your hard disk remotely and free of charge, but this can take over 15 minutes at 9.6 Kbps. New users may need updates to start using areas they haven't visited before.

You can download tools to perform tasks off-line, to use Prodigy efficiently and reduce your on-line charges. The E-Mail Connection and the Bulletin Board Manager tools let you send, receive, and manage e-mail and bulletin board messages; no on-line tools compare with them.

Prodigy has put a lot of work into providing a safe environment for children. Users must authorize each household member's account before those members can use selected Prodigy areas, including all areas that are not under Prodigy's supervision (such as Usenet Newsgroups and Chat areas). Smaller children will enjoy the Sesame Street area as well as the on-line, interactive games (including Where in the World is Carmen Sandiego?).

They can also access Homework Helper (a database of 35 periodicals and 700 reference books), the Academic American Encyclopedia, the National Geographic, and many other reference materials. Prodigy's editorial staff says the available content is appropriate.

Prodigy has succeeded in building a very complete selection of on-line information and services, but its current interface has left much to be desired. The recent release of Newsweek InterActive, though, is a good preview of what is you can expect in the next release. □



PC Magazine (UK), December 1994. Reprinted with kind permission of Ziff-Davis UK Limited.

Demand NexGen's Nx586™ Processor. Superior Performance. Unbeatable Price.

Now, you don't have to settle for a Pentium™ processor-based PC. Because there's a tough new kid on the block that delivers superior power and performance... for a *lot* less money.

It's the NexGen Nx586 processor. Manufactured by IBM Microelectronics™. With patented RISC86™ microarchitecture that outperforms the Pentium processor, megahertz for megahertz. It's fully compatible with your DOS and Windows™ applications. And it's absolutely available right now.

So just call one of the PC suppliers listed below and ask for it by name. The Nx586 processor by NexGen. Don't buy a PC without it.

NexGen Chip Challenges Pentium Performance

PC WORLD, November 1994



¹ Average score of six Pentium-90 systems.

Tests run on preproduction unit.
PC World Test Center application benchmarks.

Word 2.0 for Windows Freelance 1.0 for Windows Excel 4.0 1-2-3 release 3.4
Excel 4.0 WordPerfect 6.0 for DOS Paradox 3.3
Paradox 1.0 for Windows

Absolutely Available Right Now. Don't Buy a PC Without It!

Nx586 processor-based PCs are available from the following PC suppliers. Call the PC supplier of your choice and ask for NexGen's Nx586 processor by name.

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619-452-9540

Abernethy

Montebello, CA
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Add Tech Computer Inc.

Somerset, NJ
908-805-0900

Addit Computer

Tucson, AZ
602-294-7200

Adlaga Corporation

Santa Clara, CA
800-423-4797

Alaris

Fremont, CA
800-377-2548

Allied Manufacturing Group

Lodi, NJ
201-778-0787

Alpha Computer Center

Rockford, IL
815-229-0300

ASA Computers, Inc.

Santa Clara, CA
408-496-6995

Bullitt's Inc.

Albuquerque, NM
505-885-7521

Blackship Computer

San Jose, CA
800-531-7407

C Point

Huntington Beach, CA
800-663-5535

City Computers

Rockville, MD
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Compu-Tek

Richardson, TX
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Middleton, WI
608-831-1865

Computer Discount Mart

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Computer Parts Plus

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Computer Resources

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800-662-0834

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Data Storage Marketing

Boulder, CO
800-543-6098

Diamed Technology, Inc.

Anaheim, CA
800-889-7253

Drake Systems

Tampa, AZ
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Duracore Computer

Irvine, TX
800-792-9000

Eckstein PC's

Phoenix, AZ
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FYI Computer Source

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Gateway USA, Inc.

Westminster, CO
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Globe Computers

Scottsdale, AZ
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ICI Computer Systems Corp.

Richardson, TX
800-424-0604

Lucky Computers

Richardson, TX
214-437-5281

Lufkin International

Midville, NY
516-454-8280

M.E.C.

Norcross, GA
404-447-0736

Miami Corporation

Scottsdale, AZ
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Minibus

Monrovia, CA
800-934-6299

Mobydys International

Norcross, GA
404-449-8650

Micro Simplex

Mesa, AZ
800-477-0844

Melland Micro Computers

Salt Lake City, UT
800-424-2993

NCA Computer Products

Bonnyville, CA
800-961-1200

Net Computers International

Dallas, TX
214-266-9300

Nival Systems

Princeton, NJ
609-571-0085

Nixtrix Corporation

Leonia, NJ
201-947-2200

Omni-Tek

Brown, TX
713-764-9591

Orient Corp of America

El Monte, CA
800-442-8988

PC Concepts

Dallas, TX
214-328-2888

PC Express, Inc.

Richfield, MN
800-957-1000

PC Performance Centers

Englewood, CO
303-771-0039

Professional Technologies

Walnut, CA
800-948-5088

Rapids, Inc.

Tampa, FL
813-623-3303

Rebels, Inc.

Midvale, UT
801-565-0645

R.I.I. Radio Shack

Truth or Consequences, NM
505-894-3462

Safari Computers

Reno, NV
702-625-8688

Systems Design Computers

San Diego, CA
619-537-5737

TAP

New Brunswick, NJ
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Tangent Computers

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The Missing Byte Computers

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US Micro Express, Inc.

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800-874-9885

US Microtronics

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Vectra Computers

Quebec, Canada
1-800-VBC-3433

Vortex Computer Labs

Scottsdale, AZ
800-486-4586

West Hills LAM Systems

Chatsworth, CA
800-367-5267



THREE PENTIUM COMPETITORS

What's Next Inside?



Later this year, you will be able to buy PCs with Pentium-class CPUs from AMD, Cyrix, and NexGen in addition to Intel. Here's what you need to know about compatibility, performance, and availability.

By John Clyman

Pssst. Want to know what Intel *really* ought to worry about? It's not much-hyped RISC processors such as the PowerPC family from Apple, IBM, and Motorola. Instead, it's the coming onslaught of x86 CPUs that will outperform the fastest Pentiums available today yet still be fully compatible with existing x86 operating systems and applications software. With these Pentium alternatives coming so soon after Intel's well-publicized problems with floating-point division errors on the Pentium (see Trends in this issue), this may generate much more competition at the high end of the desktop PC marketplace.

Assuming these new CPUs meet their performance, compatibility, and cost targets, this renewed competition will mean both good news and bad news for PC buyers. On the upside, it will continue to drive dramatic price reductions and to spur innovation. On the downside, it means that purchasing decisions will become more difficult. Forget the "Intel Inside" mantra, and give up on the old rule of thumb that higher clock speed equates with better performance.

Two of the architects of these hot new processors are familiar names: Advanced Micro Devices and Cyrix Corp. Neither compa-

ny has yet delivered products that can compete with Intel's most advanced offerings, but that is about to change: AMD's K5 processor and CPUs based on Cyrix's M1 architecture are slated to ship this summer. Both companies promise performance that exceeds Pentium's by about 30 percent at a given clock speed, with initial clock speeds of at least 100 MHz. That would put these new chips on a par with, or perhaps slightly ahead of, the 120- to 133-MHz Pentium parts we expect Intel to be shipping at about that time. That parity may not last for long, though, since Intel's next-generation P6 will likely begin shipping in limited volumes at about the same time.

Incredulous about the ability of AMD and Cyrix to compete with Intel at the leading edge? That's the same thing skeptics wrongly predicted years ago about both companies' ability to build 386-compatible chips. And another company has already proved it is possible to build compatible Pentium-class CPUs: At its current top speed of 93 MHz, NexGen's Nx586 processor powers systems at roughly the level of a 100-MHz Pentium, according to our application-oriented benchmark tests. NexGen promises faster parts early this year.

You can also expect that IBM Microelectronics, the semiconductor fabrication unit that produces IBM's Blue Lightning processors, will ship Pentium competitors at some point. IBM Microelectronics will produce chips for both Cyrix and NexGen (neither company has its own manufacturing capability) and its licensing agreements permit it to sell a number of these chips on the merchant market under its own name. This contract differs from IBM's earlier agreements with Intel, which permit it to alter Intel's designs but with the stipulation that IBM sell CPUs only on motherboards or in complete systems.

Of course, matching or exceeding the performance of Intel's fastest processors won't be enough by itself to ensure the success of these alternative designs. AMD, Cyrix, and NexGen will also have to demonstrate ironclad compatibility, provide competitive prices and sufficient availability, and score design wins with major PC suppliers if they are to gain significant market share. These are all substantial hurdles but none are insuperable. PC buyers can expect that in the second half of 1995 they will have a smorgasbord of processors

486 class
586 class
686 class

Clock speed



PROS



CONS



PHYSICAL CHARACTERISTICS



INTERNAL ARCHITECTURE

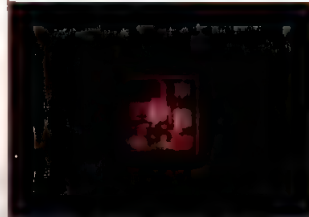


EXTERNAL INTERFACE

The Pentium

Intel DX4

75 and 100 MHz.



Compelling alternative to hot-running 60- and 66-MHz Pentiums.

Weaker floating-point performance than what the Pentium offers.

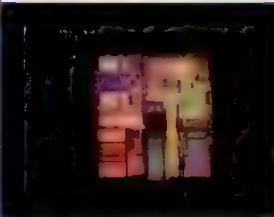
1.6 million transistors in an 8.8- by 8.8-mm die. Manufactured on Intel's 0.8-micron, 3.3-volt BiCMOS process.

Single-issue CPU with built-in floating-point unit, 16K of on-board unified cache.

32-bit address and data buses. 3x clock multiplier.

Intel Pentium (P54C)

75, 90, and 100 MHz.



Shipping now, with faster versions available soon. Extensive support from chip set, motherboard, and system manufacturers. Superscalar design outperforms similarly clocked 486 chips.

Floating-point bug may still exist in some shipping versions.

3.1 million transistors in a 12.8- by 12.8-mm die. Manufactured on Intel's 0.8-micron, 3.3-volt BiCMOS process.

Dual-issue CPU with built-in floating-point unit, 16K of on-board cache (8K code, 8K data).

32-bit address, 64-bit data bus. 1.5x clock multiplier.

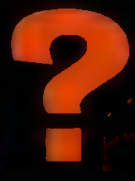
to select from at the high end of the PC marketplace.

FIRST MAKE IT COMPATIBLE

Unlike RISC vendors—which design processors based on the premise that software developers will rework their applications to support a powerful new CPU platform—AMD, Cyrix, and NexGen all assume that the ability to run existing x86 software is a prerequisite to mass-market

acceptance. This *binary compatibility* means that the Pentium competitors will run unassisted any program that can run on a Pentium; users will not perceive any difference in a computer's operation that would betray which company manufactured the processor inside. The one exception is that NexGen's basic Nx586 design does not include a built-in floating-point unit, making it sort of a "Pentium SX" that is inappropriate for certain types of numer-

and Its Competition at a Glance

AMD K5	Cyrix M1	NexGen Nx586	Intel P6
100+ MHz (projected).	100+ MHz (projected).	70, 75, 84, and 93 MHz.	Info not available.
			
RISC-like internal design promises a 30 percent performance improvement over what the Pentium delivers at equivalent clock speeds. Pin compatibility means that existing Pentium motherboards require few modifications to support it.	Extends Pentium design, promising 30 percent better performance at equivalent clock speeds. Pin compatibility means that existing Pentium motherboards require few modifications to support it.	Shipping now, with faster, smaller versions due shortly. Performs on a par with the fastest Pentiums.	First x86 product with performance that is head and shoulders above what the Pentium can do.
Not yet shipping.	Large initial die size will translate into extremely high manufacturing cost and low availability. Not yet shipping.	Pinout incompatibility with the Pentium may limit acceptance from system vendors. Only NexGen supplies chip sets.	Likely to be expensive and in short supply until 1996. Will require new motherboard designs.
4.3 million transistors. To be manufactured in late summer on AMD's 0.5-micron, 3.3-volt CMOS process. Die size not available.	3 million transistors in a 20.3- by 19.4-mm die. To be manufactured in late summer on IBM Microelectronics' 0.5-micron, 3.3-volt CMOS process.	3.5 million transistors in a 14- by 14-mm die. Manufactured on IBM Microelectronics' 0.5-micron, 4-volt CMOS process.	6 million transistors. To be manufactured later this year on Intel's 0.6-micron, 3.3-volt BiCMOS process. Die size not available.
Quad-issue CPU supporting out-of-order issue and out-of-order execution. Built-in floating-point unit, 24K of on-board cache (16K code, 8K data).	Dual-issue CPU supporting out-of-order execution. Built-in floating-point unit, 16K on-board cache supplemented by 256-byte instruction-line cache.	Single-issue CPU supporting out-of-order issue, out-of-order execution. Optional floating-point unit. 32K of on-board cache (16K code, 16K data).	Info not available.
32-bit address, 64-bit data bus. Pentium-compatible pinout.	32-bit address, 64-bit data bus. 2x clock multiplier. Pentium-compatible pinout.	32-bit address, 64-bit data bus. Integrated L2 cache controller.	Info not available.

ically intensive activities such as CAD. But most mainstream business users rarely employ the floating-point unit, so NexGen's solution offers a potential cost savings. (For those who need it, a version with floating-point capability is available.)

* Make no mistake about it: AMD, Cyrix, and NexGen are *not* building Pentium clones. The internal designs of the chips differ dramatically—to an even greater extent than, say, Cyrix's 486SLC series differs

from Intel's 486SX line. Each of the companies has made a different set of trade-offs in its design in an attempt to build CPUs that can provide better performance than Pentium at a similar price, or equivalent performance at a lower price. (See the accompanying story "Inside the Chips" for detailed descriptions of the internal workings of the chips.)

In fact, the companies have tried to learn from Intel's missteps and avoid some

of the pitfalls Pentium encountered. For instance, Intel initially announced that, although existing software would run faster on a Pentium than on a 486, software developers would have to recompile applications to reap the maximum performance benefit from Pentium's superscalar design. Instead of placing the burden on software developers that have proved reluctant to make the effort, Intel's competitors have built their chips to boost the performance

A whimsical illustration of two men in kilts dancing in a snowy landscape. One man wears a brown hat and the other a black top hat. In the background, there are sheep, a wooden cart, and a log cabin.

THE STATION IN CHUGWATER, WYOMING



AND
THINGS HAVEN'T
BEEN THE SAME SINCE.

Of course we're not going to say Chugwater would have turned into a cultural wasteland if it weren't for *The Thistle & Shamrock* show. We're just saying that the more clearly you get your point across, the more likely it'll be heard. (Something to think about next time you're looking for a raise.)

And now for a word from our sponsor: If you'd like to hear a little more about Microsoft Word 6.0 or any of the other fine products that make up Microsoft Office, just give us a call at (800) 240-4782, Department NEC. We're pretty sure you'll be impressed with the reception.



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of existing code. Also, AMD's and Cyrix's chips will be built on 3.3-volt CMOS processes, so they should avoid the heat problems associated with early 5-volt (60-MHz and 66-MHz) Pentium designs and some of the manufacturing difficulties of the BiCMOS process that Intel uses. (The Nx586 currently runs at 4 volts.)

MEGAHERTZ IS MEANINGLESS

The truly dramatic internal differences among Pentium-class CPUs give rise to a confusing fact: Clock speed alone can't tell you how a system will perform.

While this has previously been true—a 60-MHz Pentium, for instance, powers systems at about the speed of a 100-MHz DX4—it has also been true that, within a given family of CPUs, higher clock speeds generally denoted faster performance. Not so anymore.

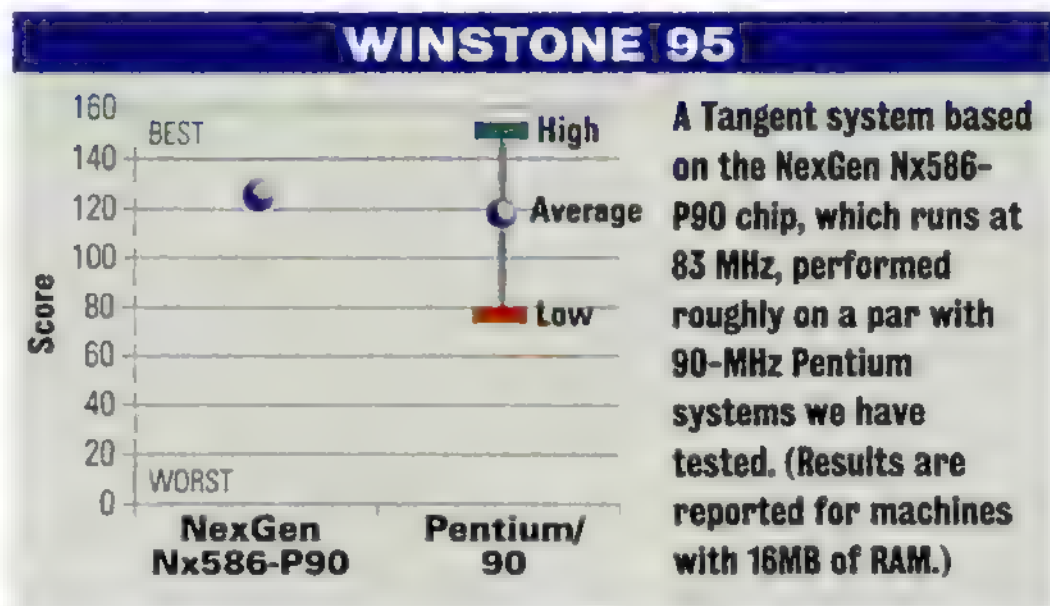
The potential for confusion is so acute that NexGen has abandoned the time-honored tradition of tagging processors with clock speeds. Instead, the company labels each CPU with the speed of the Pentium CPU it feels is most comparable. Thus the full name of a 93-MHz NexGen processor is the Nx586-P100, because system-level benchmark tests such as Winstone 95 show the 93-MHz part to compare favorably with a Pentium/100.

AMD and Cyrix will face a similar naming conundrum when their products ship; we cannot predict how they will address the issue, since neither company has yet announced final product names. One possibility is that the vendors will adopt a third-party performance metric to replace or augment megahertz ratings. Intel developed its iCOMP rating system to address the same issue (and demonstrate, for instance, that a 66-MHz Pentium could outperform a 66-MHz 486), but other vendors have proved understandably reluctant to adopt an Intel-promoted performance measure.

A LOOK INSIDE

Cyrix's M1 architecture most closely parallels that of Pentium: Like Pentium, it's a *su-*

perscalar CPU capable of executing as many as two instructions per clock cycle on two separate pipelines. But that is where the similarity ends. Pentium can issue instructions to both pipelines only under extremely restrictive circumstances; Cyrix's M1 design expands the number of cases



where instructions can be paired, which should increase the pipelines' throughput. M1 also implements data-bypassing and data-forwarding capabilities that help prevent pipeline stalls that can slow Pentium.

NexGen's Nx586 and AMD's K5, on the other hand, are unlike Pentium or any other x86 CPUs yet developed. Their fundamental performance-enhancing technique is to convert irregular x86 operations into simple, highly regularized, RISC-like operations before attempting to operate upon them. Although Intel claims that Pentium has a "RISC-like" core, that simply refers to Pentium's ability to execute many operations in a single clock cycle and to avoid using microcode for many operations. The Nx586 and the K5 are structured much more like RISC processors with tightly integrated translation units that let them accommodate x86 code. Their internal instruction formats—called RISC86 by NexGen and ROPs by AMD—adhere to traditional tenets of RISC design. The instructions are all the same length and are encoded in consistent formats; only specific load and store instructions can access memory.

All three of the Pentium alternatives implement some form of register renaming to mitigate the bottlenecks imposed by the limited number of registers supported by the x86 architecture.

K5, M1: PROMISING DESIGNS

Internal differences in Pentium-class CPUs should be invisible to consumers and invisible to software, but they do raise system-design issues that PC vendors need to consider. These issues affect system pricing and availability, which ultimately also affect PC buyers.

AMD and Cyrix offer the cleanest solution to PC vendors, because their Pentium-class processors are pin-compatible with Pentium itself. This means that a single motherboard design can support a Pentium, a K5, or an M1 processor—whichever provides the right price/performance ratio for a particular buyer. This doesn't necessarily imply that existing motherboard designs can directly support all three of these processor families, but the design modifications required are minimal. The core-logic chip set—which arbitrates among the CPU, level 2 (L2, or secondary) cache, memory, and expansion bus—needs to be updated, and a few jumpers might need to be added.

Today, one of the largest manufacturers of core-logic chip sets for Pentium and for complete Pentium motherboards is Intel itself. Clearly, Intel has a vested interest in not supporting alternative CPUs with its components but we expect a number of third-party chip set and motherboard vendors to step forward with K5- and M1-compatible designs later this year. OPTi has already announced that its Viper chip set will support K5 and M1 in addition to Pentium. OPTi says the external operation of the K5 and M1 chips is similar enough to Pentium's that Viper won't be saddled with additional overhead by supporting all three. (Previous OPTi chip sets supporting both VL-Bus and the PCI bus on Pentium PCs were poor performers compared with PCI-only chip sets from Intel.)

Will major system vendors be interested in non-Intel CPUs? It's certainly likely. Many system vendors have expressed agitation about feeling captive to Intel and would gladly embrace an alternative CPU supplier. Compaq, which already uses 486-class processors from AMD in a number of products, including its successful Presario line, has publicly stated that it will evaluate all x86-compatible processor options.

Our Contributors: JOHN CLYMAN is an associate editor of *PC Magazine*. NICK STAM is technical director for hardware at PC Magazine Labs.

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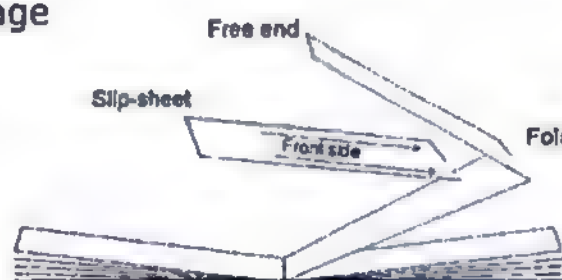
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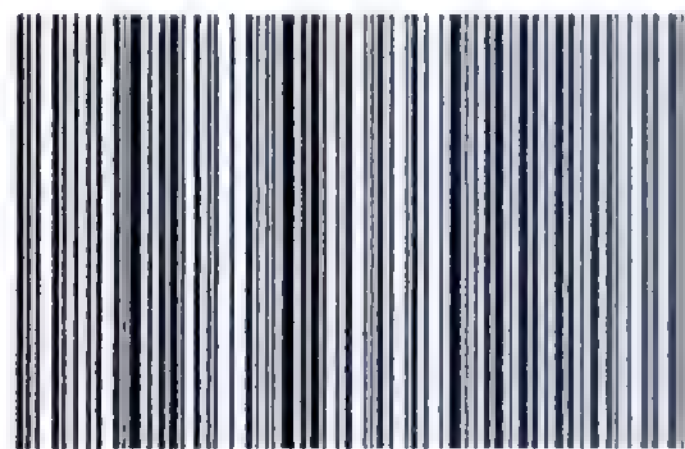
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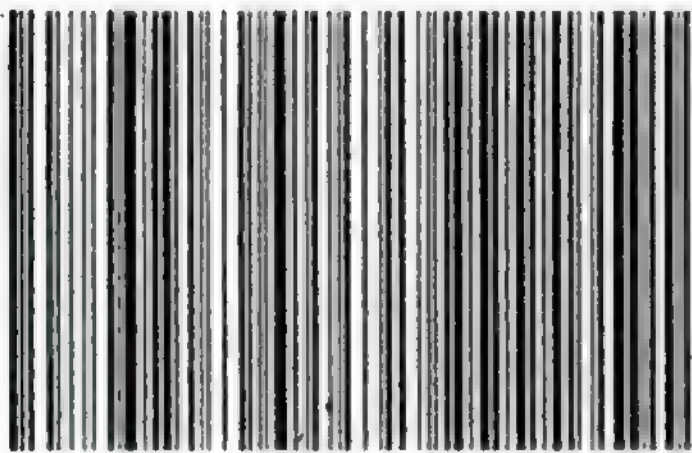
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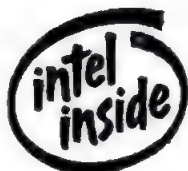
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(Compaq is also an investor in NexGen.) And the fiasco surrounding the Pentium floating-point bug has likely tarnished Intel's reputation.

Nx586: FORWARD-LOOKING

The prospects for NexGen's Nx586 are somewhat shakier, at least in the near term. The biggest liability of the Nx586 is its lack of pin-compatibility with Pentium; as a result, the Nx586 requires a unique motherboard design. This may limit the Nx586's initial appeal to many system vendors that don't want to sustain the overhead of keeping a second motherboard design in stock.

The pinout of the Nx586 differs from that of Intel's Pentium for a reason.

Most x86 processors communicate with a core-logic chip set that manages memory and L2 cache accesses. But NexGen chose to integrate the L2 cache controller onto the processor itself and to communicate with the cache at the full processor speed, rather than two-thirds the processor speed (like Pentium) or half the processor speed (like Cyrix's M1). This should improve performance, but it also means that the processor needs to adopt a nonstandard signaling pattern and use a larger number of pins.

Ultimately, this decision may work to NexGen's advantage. At some point, Intel's competitors have to make a decision: Do they wait for Intel to decide where the market is going and then come out with a compatible, slightly improved product 12 to 18 months later? Or do they blaze their own trails? AMD has hinted that two to three years from now it may abandon pin-compatibility with Intel designs as a goal and pursue radically different designs, so perhaps NexGen's design is a look at the future.

Today, the only supplier of core logic for NexGen-based systems is NexGen itself. When the Nx586 was introduced, NexGen's chip sets supported only VL-Bus, but the company plans to ship a chip set that supports the PCI bus. Nx586 systems are currently available from a handful of companies, including

Alaris (510-770-5700), Blackship (800-531-7447), Data Storage Marketing (800-543-6098), Diamond Technologies (800-989-7253), Duracom (800-551-9000), and Tangent (800-800-5500).

COST AND AVAILABILITY

The Nx586 has the advantage of being the only Pentium competitor that is actually shipping today. AMD and Cyrix manufactured their first internal samples late last year and are still testing and debugging. Although both companies expect to begin shipments around midyear, delays are always a possibility. In fact, Cyrix's M1 already appears to have slipped: It was first announced nearly 18 months ago, unusually far in advance of its actual production date.

AMD, Cyrix, and NexGen must all ensure that their processors can be manufactured economically if they are to compete with Intel. A microprocessor's manufacturing cost depends primarily on the area of silicon that it occupies—not because silicon itself is expensive, though. Larger chips translate into fewer chips per silicon wafer; with fewer chips per wafer, multiple microscopic flaws on different areas of the wafer can dramatically affect the yield of good processors. By reducing processor size, on the other hand, more processors can be produced per wafer, so the cost per chip goes down.

The Cyrix M1's initial die size of nearly 400-mm square—more than twice that of the 90- and 100-MHz Pentiums—will put that chip at a significant cost disadvantage until Cyrix is able to scale down the size. Cyrix says it laid out the M1 conservatively, before it settled on IBM Microelectronics as a foundry, to make it adaptable to a variety of fabrication processes. The company is now shrinking and altering the chip's layout, which should make it more competitive.

Cyrix's agreement with IBM should give the company sufficient capacity to meet demand, assuming a reasonable yield rate.

NexGen's Nx586 is closer to Pentium in die size, although it will undergo a dramatic shrinkage early this year. AMD, the only Intel competitor to manufacture the chips itself, has not yet disclosed K5's die size. Although AMD is currently limited in fabrication capacity because of the large volume of 486s it is producing, the company is completing a new facility that should have more than sufficient capacity to meet market demand.

THE FUTURE LOOKS BRIGHT

AMD, Cyrix, and NexGen all face obstacles in the months ahead. AMD and Cyrix face technological hurdles while NexGen faces the marketing challenge of selling a device that requires motherboard redesign. But in many ways, their timing couldn't be better. Intel's image has suffered from the Pentium-bug fiasco and, more importantly, Intel will have to devote a substantial portion of its production capacity to replacing defective chips already sold—just as Pentium's volumes are really taking off. That leaves a significant opportunity for any vendor that can provide competitive price/performance. At the very least, it is likely to drive Intel into another round of deep price cuts that will mean sub-\$1,500, fully equipped Pentium systems by year-end.

Although M1, K5, and the Nx586 will appear in high-end desktop systems at first, you can also expect to see derivative chips appear in notebooks and servers as market penetration increases. Over time, the chips will get faster, tracking with Pentium's anticipated steps up to 150 MHz by year-end.

Previously, Intel has begrudgingly allowed AMD and Cyrix to lap up market share in previous-generation CPUs. Now, AMD and Cyrix are challenging Intel closer to home. Whether they ultimately succeed or not, the intensified competition is sure to spell even better bargains and to continue to push the performance envelope.

The Nx586 incorporates an L2 cache controller, which should boost performance but requires novel motherboards.

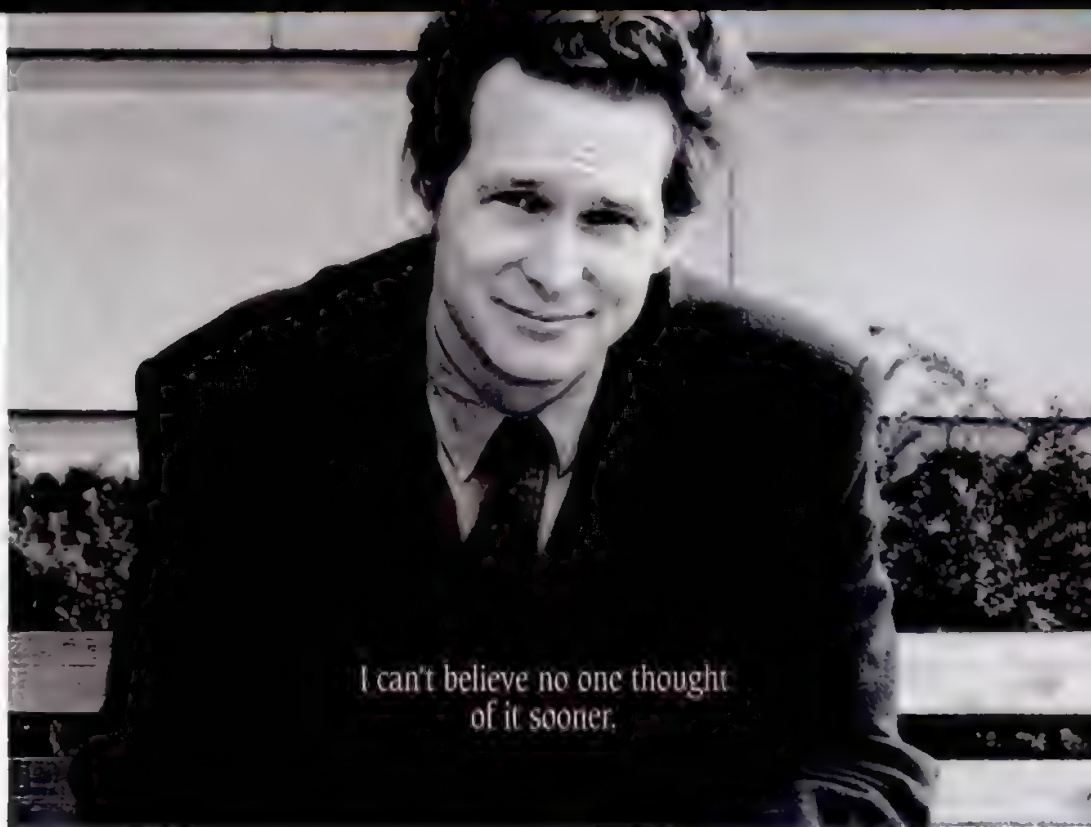
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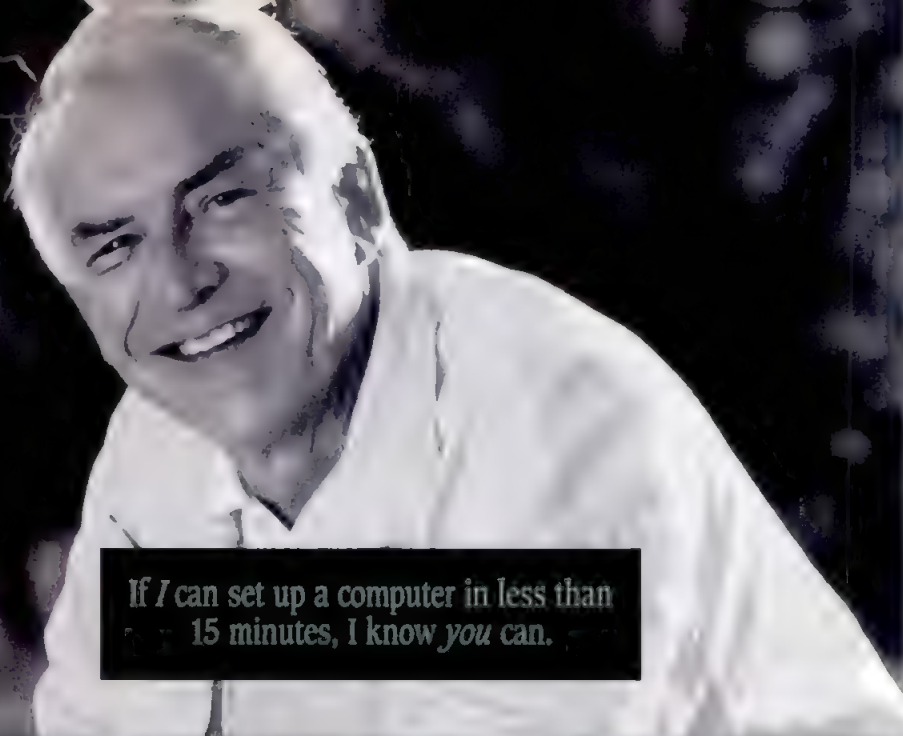


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Inside the Chips

586-class processors from AMD, Cyrix, and NexGen aren't just knockoffs of Intel's Pentium. See how they advance the state of the art.

By Nick Stam

Although you don't need to understand how a microprocessor works in order to operate a computer any more than you need to understand an internal-combustion engine in order to drive a car, familiarity with some basic concepts can help you sort through the buzzwords and marketing hype associated with high-performance CPUs.

Microprocessor designers strive to provide high performance and full compatibility—at a reasonable price. Of the multiple factors that affect CPU performance, the simplest one to target is clock frequency: Increase the clock speed and the processor gets faster. But there are fundamental limits to how fast you can run a chip, especially a complex x86 chip; sooner or later, a series of components inside simply can't keep up.

Intel's competitors in the high-performance x86 market—AMD, Cyrix, and NexGen—promise clock speeds of 100 MHz and faster. But they claim their chips will outperform a comparably-clocked Pentium, thanks to more aggressive designs that are able to execute more instructions per clock cycle.

PIPELINING

Modern microprocessors employ a *pipelining* technique that lets them work like assembly lines. At any given time, a pipelined processor is working on different stages of several instructions. Every time the clock ticks, each instruction in the pipeline is advanced to the next stage;

a completed instruction leaves the pipeline and a new one enters it. (See the diagram "Classic Five-Stage Pipeline" on the facing page.) Although instructions may still take five or more clock cycles to propagate from the beginning of the pipeline to the end, the processor can actually complete execution of one instruction in every clock cycle under ideal conditions.

Some processors divide the five basic pipeline stages into multistage operations to reduce the complexity of each stage, creating what some manufacturers call a *superpipelined* design. Cyrix, for example, calls its seven-stage M1 architecture superpipelined. The theory behind superpipelining is that fewer logic operations need to be performed in each pipeline stage so that each stage can be completed in a shorter time, allowing for a higher

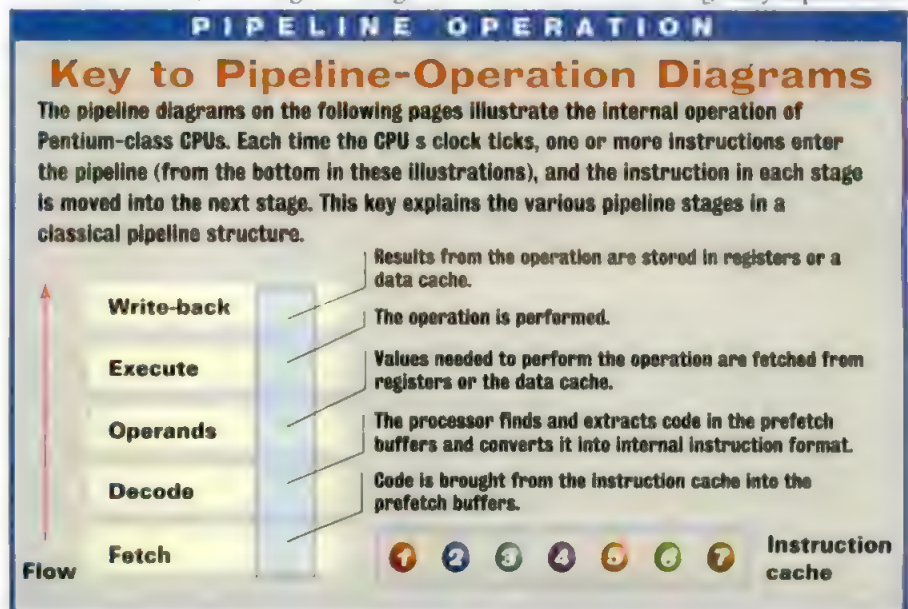
clock frequency.

AMD's K5 employs six pipeline stages and NexGen's Nx586 employs approximately seven; however, neither of these manufacturers refers to its design as superpipelined. The AMD K5 and NexGen pipelines deviate from a classic multistage pipeline where one stage passes information to the next in a sequential and synchronized fashion. Both designs *decouple*, or separate, their instruction-fetch and decode logic from their execution units, permitting decode operations to proceed independent of execution (see the diagram "Superscalar Architecture—Decoupled Pipeline").

SUPERSCALAR DESIGNS

A processor with a single pipeline is known as a *scalar* processor; only one instruction can enter the decode stage (near the beginning of the pipeline) at a time. Advanced processors that incorporate multiple pipelines are called *superscalar*. These processors can execute more than one instruction in a given clock cycle so they can process more instructions than a scalar processor at the same clock speed. (See the diagram "Dual-Issue Superscalar Design.")

Not all superscalar processors are created equal. Intel's Pentium and Cyrix's M1 architecture can issue and execute two instructions down two pipelines so they're dubbed *dual-issue* processors. AMD's K5 is a *quad-issue* processor. NexGen's Nx586 is arguably superscalar:



It can issue only one x86 instruction per cycle, but these x86 instructions are translated into multiple "RISC86" instructions that can then be executed simultaneously.

None of these processors will always be able to issue the maximum number of instructions that their designs allow. Intel's Pentium, for instance, imposes stringent restrictions on the types of operations that can be issued simultaneously (see the diagram "Impact of Issue Restrictions"). Cyrix's M1 and AMD's K5 are both more liberal but still have limitations.

OUT-OF-ORDER EXECUTION

Increasing the average number of instructions that can be issued per clock cycle is critical to maximizing CPU performance. In the most straightforward implementation of a superscalar design, the CPU can be severely hamstrung by certain situations that stall, or hold up, one of its pipelines. In a processor such as Intel's Pentium, which employs *in-order issue* and *in-order completion*, anything that stalls the completion of an instruction in one pipeline will stall the other pipeline as well, because instructions have to leave the pipelines in exactly the order that they were inserted. (Essentially, the pipelines operate in lockstep; see the diagram "Impact of Pipeline Stalls.") This seems to be a rational way to design a processor, but it may not be the most effective from a performance standpoint.

A design that supports *out-of-order completion* can let one or more pipelines continue functioning when another is stalled. Thus instructions later in a program can actually be completed before preceding instructions that had stalled in a different pipeline. Naturally, the processor must ensure that results are not written to memory and registers are not updated in the wrong order, as this could cause erroneous results. Cyrix's M1, AMD's K5, and NexGen's Nx586 all support out-of-order completion (also called *out-of-order execution*).

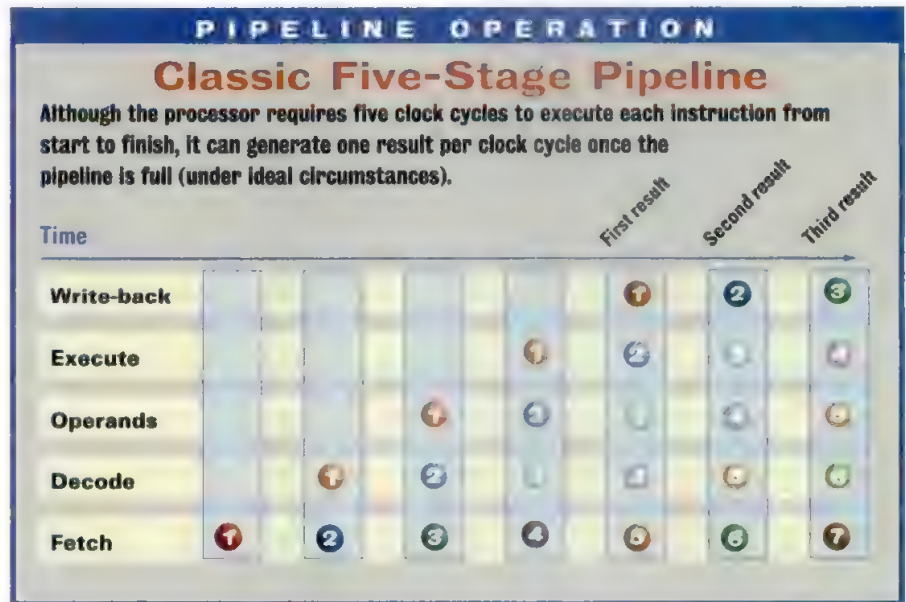
Out-of-order issue takes this concept a step further, letting the processor issue instructions out of program order as well. Out-of-order issue typically requires an instruction buffer, or *instruction window*, between the decode and execute stages

of the pipeline. Some processors use a central instruction window, which buffers all decoded instructions destined for all execution units. If such a processor determines that an instruction can't be executed at the moment, it can send a later instruction to an execution unit instead to keep things moving.

An alternative design employs small instruction windows called *reservation sta-*

multiplication and the addition simultaneously even if you have the hardware to do it; the rules of arithmetic dictate that the multiplication has to be completed first. This situation is known as a *true data dependency* (or *read-after-write dependency*), meaning that the input to the addition problem depends upon the result of the multiplication problem.

Two types of *false dependencies* can



tions that precede the input to individual execution units. When the execution unit finishes one instruction, it receives the next one from the reservation station. The processor sends instructions to the reservation stations in order, but instructions can end up out of order when they are passed to the functional units since some reservation stations will be depleted more quickly than others. This is the approach AMD's K5 takes; preceding each of the six functional units in the processor is a reservation station that can hold two instructions. NexGen's Nx586 uses a similar approach, but with much deeper 14-instruction reservation stations in front of each functional unit.

REGISTER RENAMING

There is a diminishing return to increasing parallelism: No matter how many instructions a processor can potentially execute simultaneously, its performance will be limited because some operations simply can't be completed before others. For instance, if you want a machine to calculate $n \times 2 + m$, it's not possible to perform the

also detract from performance. For instance, if two successive instructions perform separate calculations but write their results to the same register, executing the second instruction before the first would cause an *output dependency* (or *write-after-write dependency*) between the second and first instructions. This arises because the processor must ensure that the register is updated correctly, even though the instructions that updated it were not executed in order. The second type of false dependency, *antidependency* (*write-after-read dependency*), occurs when the second instruction would overwrite data needed as input by the first instruction.

Dependencies are particularly troublesome for x86 processors, which support a limited number of *registers*—temporary on-chip holding areas for data. The x86 architecture defines only eight general-purpose registers, far fewer than do most RISC processors. As a result, individual registers are reused frequently; this leads to dependencies, reducing performance.

It's possible to increase performance

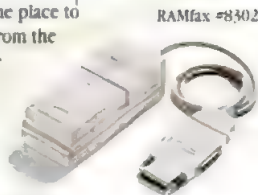
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bypassing and forwarding; Cyrix's M1 implements operand and result forwarding plus register and memory bypassing; and NexGen's Nx586 is able to forward data from memory queues and bypass among various stages of the pipeline. Cyrix attributes much of M1's claimed 30 percent performance improvement over Pentium to data-forwarding and -bypassing schemes.

BRANCH PREDICTION

All of these performance-enhancing tricks—superscalar designs, out-of-order issue, data forwarding—are barely worth the effort if a chip designer doesn't attack the problem of *procedural dependencies* caused by program branches. A branch is a change in the sequential flow of code. A branch can be dependent upon the result of a comparison (as in *if $x > 0$, go do this*), in which case it is known as a *conditional* branch. Branches can also be mandatory, or *unconditional* (as in a simple *goto* statement).

Branches occur, on the average, once every six or seven x86 instructions. Since

conditional branches are not typically resolved until the execute stage of the pipeline, the processor can't know what instructions to push into the pipeline immediately following the branch instruction. (If $x > 0$ in the example above, the processor needs to execute a different set of instructions than if $x \leq 0$.)

The best the processor can do when it encounters a branch is to make a guess—a technique known as *branch prediction*. Without branch prediction, the processor would have to flush partially completed instructions out of its pipelines whenever it took a branch. That imposes a particularly harsh penalty on superscalar processors because so many instructions can be in the pipeline in various stages.

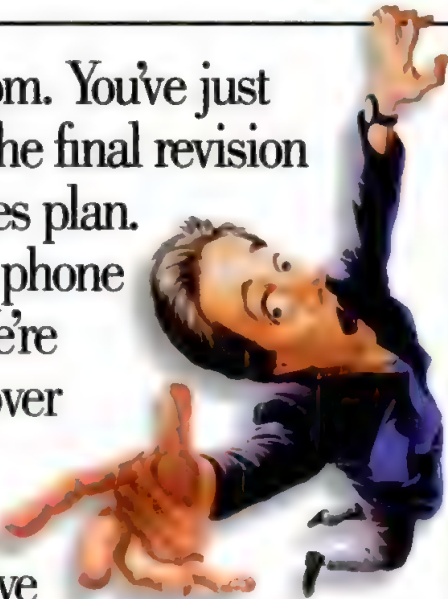
A processor can predict that a branch will either be taken or not be taken. Either way, the processor begins fetching instructions from the predicted branch target address even before it knows whether its prediction was correct. The processor can even begin executing some of these instructions before the branch condition is resolved, a tech-

nique known as *speculative execution*. (The processor cannot update architectural registers or memory until the branch is definitively resolved, however.) Some processors permit multiple levels of speculation by predicting additional branches even before the first is resolved.

Sometimes the processor will *mispredict*, or "guess" wrong. When this happens, it must back out of any speculatively executed instructions and flush its pipelines. In general, mispredicted branches impose a heavy toll on performance, so all of the Pentium-class CPUs are designed to minimize their occurrence.

Both Cyrix's M1 and Intel's Pentium employ a 256-entry *branch target buffer* to perform their branch prediction. The branch target buffer tracks the historical behavior of 256 of the most recent branches and contains prior branch behavior to help make the prediction. Branch prediction in Cyrix's M1 architecture goes even further, adding a *return stack* that specifically tracks branches

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taken as part of a CALL/RETURN sequence.

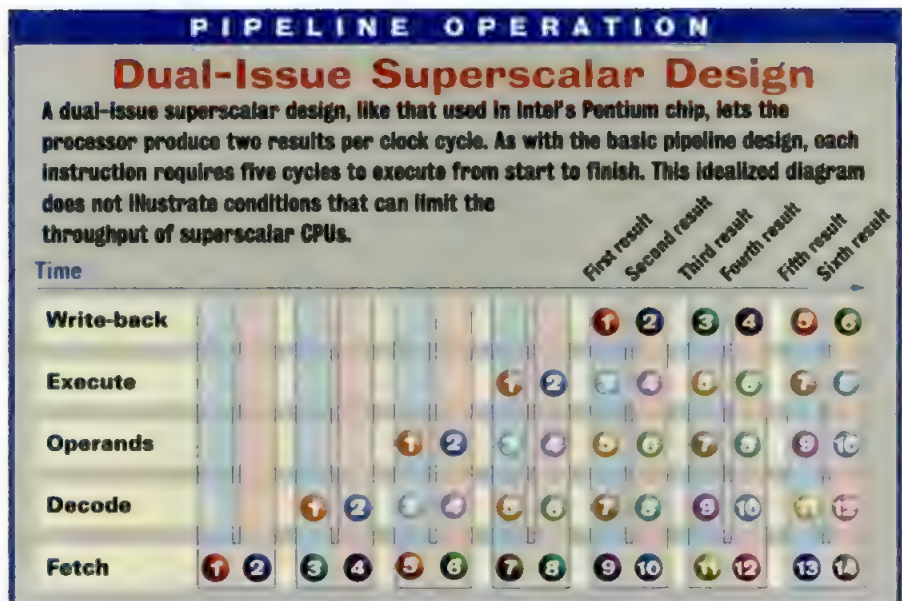
AMD's K5 processor takes an entirely different approach to branch prediction. Rather than maintain a dedicated branch target buffer, K5 adds branch information to each of the 1,024 16-byte lines of the on-chip instruction cache. This information indicates the target address of the first branch in the cache line and specifies whether the branch should be predicted as taken or not taken. A minor shortcoming of this approach is that branch information cannot be retained for more than one branch per cache line.

NexGen does not disclose details of its patented branch-prediction mechanism. A *Microprocessor Report* study based on the patent filing indicates that the Nx586 uses a branch target cache with 96 branch entries, each composed of 24 instruction bytes beginning at the branch target address.

x86 COMPATIBILITY:

A DESIGNER'S NIGHTMARE

For any Pentium-class CPU to succeed in the mass market, it must retain compati-



bility with the thousands of existing and any future x86 applications. This is a particularly daunting task because the x86 architecture has one of the most complex instruction sets ever devised for a processor. Other peculiarities of the x86 architecture, such as system-level control regis-

ters, protection mechanisms, and external event handling, affect operating-system and application software as well and must be supported.

It is this kind of complexity that drives many designers toward RISC, which employs consistent instruction lengths and

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encodings and generally shuns complex, difficult-to-implement instructions. In fact, AMD's K5 and NexGen's Nx586 both employ RISC-like cores, with circuitry that translates x86 instructions into internal instructions that are simpler to handle. AMD calls these simplified internal instructions ROPs (RISC operations) and NexGen calls them RISC86 instructions. Adhering to traditional RISC philosophies, both RISC86 instructions and ROPs are fixed in length and have highly regularized instruction fields, which help streamline instruction flow and reduce the size and complexity of functional units. Also following the lead of RISC processors, NexGen's Nx586 and AMD's K5 access memory only with load and store instructions.

TURNING CISC INTO RISC

Rapid instruction decode is a prerequisite to issuing multiple instructions per cycle, and each of the superscalar x86 processors includes different mechanisms to address this challenge.

The critical x86 decoding problems are determining where one instruction ends and the next one begins and then aligning the instructions so they can be more efficiently processed by the decoder. AMD's unique solution handles much of the complexity of x86 instructions before the decode stage. The K5 generates *predecode* bits for each byte loaded into the instruction cache. Every byte in the instruction cache has five bits of associated predecode information that indicate where the instruction starts and ends and how many basic RISC-like operations are required to complete it. The predecode process incurs few, if any, performance penalties because it happens when instructions are fetched from main memory into the instruction cache and prior to standard pipeline operations. It does,

however, have an impact on the size of the instruction cache, which balloons by nearly 8K.

When K5 actually fetches instructions from the cache, it already knows where the instruction boundaries are. The processor passes the instruction cache contents (along with predecode bits) to four ROP converters, units that translate x86 instructions into a series of simpler ROPs. Each ROP converter is capable of decoding any x86 instruction; some extremely complex instructions are passed onto a microcode-based unit called the MROM, which handles them by generating a series of ROPs. Depending on the complexity of the x86 instruction sequence, K5 may process anywhere from one to four x86 instructions per clock cycle. AMD reports that K5 issues an average of about two x86 instructions per cycle.

In NexGen's Nx586, prefetch circuitry determines instruction length and performs alignment of the x86 instructions. A decoder/scheduler unit translates the x86 instructions to RISC86 instructions and dispatches these to the execution units.

Both NexGen's Nx586 and AMD's K5 require two decode stages for the x86-to-RISC86 or x86-to-ROP conversion. Cyrix's M1 requires two stages for instruction decode as well, but is a bit more like Intel's Pentium in its design. Cyrix's M1 fetches up to 16 instruction bytes during the prefetch stage; it determines the length of x86 instructions in

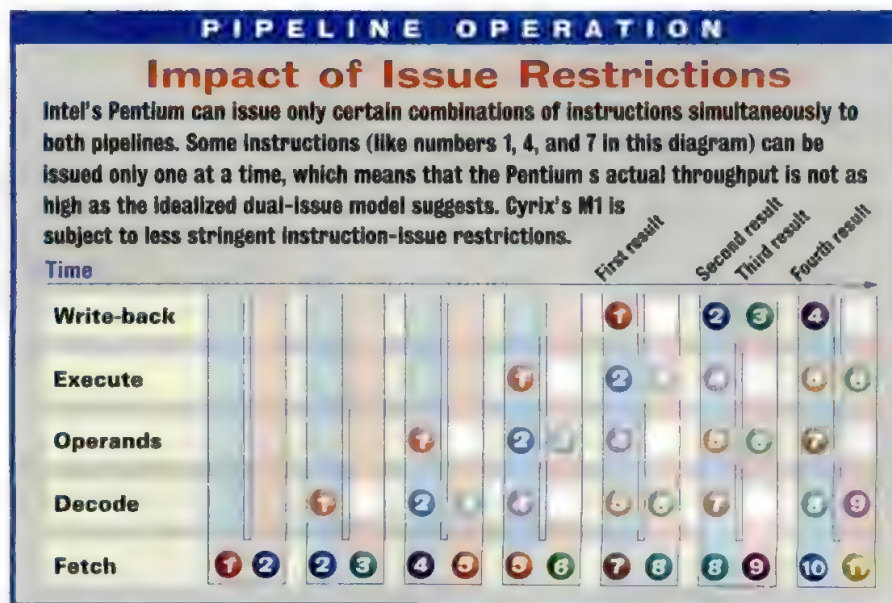
the Decode1 stage and fully decodes the instruction during Decode2.

FLOATING-POINT UNITS

One of the features that historically has set RISC processors apart from CISC processors is superior performance on *floating-point calculations*, those involving numbers other than integers. Most business applications perform few, if any, floating-point operations; even when you use numbers with decimal points, they are often represented inside the processors as integers. The bug in the floating-point unit in Intel's Pentium has drawn significant attention to floating-point operations, but they are still important mostly in engineering and scientific programs and some complex financial operations.

NexGen is notable for the omission of a floating-point unit from its basic Nx586 products. A version with floating-point capability is built as a multichip module.

AMD focused its design efforts on integer performance and does not expect K5's floating-point unit to outperform Pentium's. The K5 does implement register renaming for floating-point registers, which should help reduce the impact of certain types of dependencies. Cyrix's M1 architecture includes a four-instruction reservation station for the floating-point unit, which allows what Cyrix calls speculative execution (essentially out-of-order issue) of floating-point instructions.



ON-BOARD CACHE

Another hurdle to improving processor performance derives from the relatively slow speed of system RAM. In order to reduce the penalty associated with off-chip memory accesses, high-performance CPUs implement an internal cache. The Harvard cache architecture, which splits the internal cache into separate code and data sections, is

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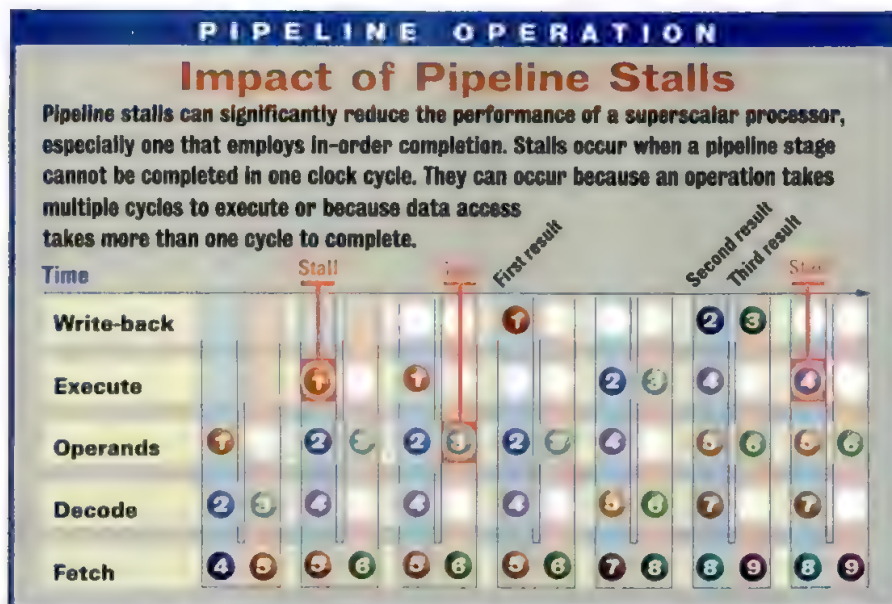
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most popular in high-performance processors. The alternative, a unified cache, offers the benefit of being able to dynamically allocate cache memory to support either data- or code-intensive processing scenarios but has the major drawback of causing conflicts between code and data access at various pipeline stages.

Cyrix's M1 has a dual-ported, four-way set-associative 16K unified cache comprised of 512 lines of 32 bytes each. This cache is supplemented by a 256-byte instruction-line cache, which holds the most recently executed instructions. Cyrix claims that this unique design is very effective for rapidly handling tight code loops.

AMD's K5 uses a split-cache design with a dual-ported 8K data cache and a 16K instruction cache comprising 1,024 16-byte cache lines. (The 16K instruction cache actually totals 24K in size because of the overhead added by predecode bits.) The data cache is comprised of four separate banks, and both of the K5's load/store units can access the data cache simultaneously if the accesses are to different banks.

NexGen's Nx586 has the largest internal cache of all: 16K for data and 16K for instructions. The Nx586 also provides an on-board level 2 cache controller. The on-board cache controller drives a dedicated 64-bit cache bus that provides access to external SRAM cache without contention from other devices.

This dedicated cache bus runs at the full clock speed of the processor. By contrast, Pentium's processor bus runs at two-thirds the internal CPU speed and Cyrix's M1's runs at half that speed; AMD has not disclosed the K5's bus speed. The downside of NexGen's separate cache bus is that it mandates a larger—and nonstandard—pinout.

All of the chips provide the necessary cache coherency logic to operate in multiprocessor environments.

EVALUATING THE OPTIONS

Since two of the four Pentium-class processors discussed here are not yet available in shipping systems, it is difficult to predict which combination of techniques will prove to be most effective under real-world usage. It is also impossible to know how implementing these techniques will affect manufacturability of the chips; adding capabilities like out-of-order issue, data forwarding, and branch prediction inevitably increases the die size of a processor, which makes it more expensive to build.

What is certain is that Intel does not have a monopoly on design techniques for high-performance x86 processors and that even more innovation is still possible. If you think the techniques being used to boost performance today are mind-bending, stay tuned for even more radical performance-enhancing tricks in the next generation of x86 CPUs. □

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PERSONAL TAX PREPARATION

Happy Returns



After a Taxing Year

By Kathy Yakal

The federal Revenue Reconciliation Act of 1993 left considerable turbulence and taxpayer anxiety in its wake. Over the ensuing year, the personal tax software industry created its own choppy waters. Intuit, which had acquired Chipsoft in 1993, took Parsons Technology on board. The Justice Department approved this deal only on the condition that Parsons license its Personal Tax Edge to a competitor—WordPerfect, as it turned out, which has released its own version of the product called Tax-

Saver. If and when the proposed acquisition of Intuit by Microsoft is approved, Microsoft will then be the publisher of two of the top tax preparation products: TurboTax and Personal Tax Edge. Computer Associates International complicated the picture by spinning off its consumer products, including Simply Tax, into a new division, 4Home Productions.

The Kiplinger organization is once again selling its version of Block Financial Software's TaxCut, and BT&T Consumer Technology has introduced the first commercial OS/2 tax preparation product, TaxDollars

Shakeout, consolidation, mergermania: Whatever you want to call it, it hit the tax software industry big-time in 1994. So far, users seem to be the clear winners in all the activity.

► IN THIS REVIEW

AM-Tax Personal 1040.....	204	TaxSaver.....	218
Kiplinger's TaxCut.....	208	TurboTax.....	224
Personal Tax Edge.....	218	Editors' Choice.....	203
Simply Tax for Windows.....	210	Ten Things You Should Know	
TaxCut.....	208	About Electronic Filing.....	215
TaxPerfect Personal 1040.....	222	Summary of Features.....	219

Three Roads to a Complete Return Experience

Most of today's programs give you two and sometimes three ways to fill out your return.



Direct Data Entry

The original—and still the quickest and simplest—method of software-aided tax preparation is *direct entry*, where you move through the forms and schedules filling in the requested information directly from your records. The program performs all the arithmetic and transfers numbers and other data to appropriate lines in other forms.



File Cabinet

Also known as a *shoebox* or *organizer*, this feature helps you organize those dozens of tax-related pieces of paper you collect over the course of the year. It also presents you with a list of documents and other items and shows you exactly where to place the information in your return.



Interview

This technique transforms the inherently unstructured process of filling out a tax return into a clear linear process. An interactive question-and-answer session guides you through the entire ordeal, branching off the main road onto whatever side paths are required to make your particular return complete.

(see the sidebar "OS/2 Users Do Their Taxes, Too").

Amid all this activity, the titles themselves have also undergone major changes—possibly more than in any other year. Interfaces are clearer. Navigation is simpler. Guidance is improved. In short, personal tax products are more comprehensive and usable than ever. It's getting harder to find a reason not to use one.

COMPELLING RATIONALE

Whether you use the simplest DOS package or the most feature-packed Windows title, there are many advantages to doing your taxes electronically. For example, if you use a personal finance program, you can export its data in Tax Exchange For-

mat (.TXF) to most tax programs. TurboTax's new TaxLink feature goes even further: It pulls data in automatically from Quicken 4 for Windows and lets you edit entries before importing. It also runs Quicken in the background so changes are automatically updated. TaxCut allows a similar preimport perusal of imported values, but without the dynamic update.

The tax products we review here include enough IRS forms and schedules to meet the needs of most individual taxpayers. The 1040 templates indicate which lines require supporting forms, schedules, and worksheets. Most programs offer a quick way to jump back and forth between related lines in different documents

and automatically transfer text and numbers that must appear elsewhere. These basic features save time, help prevent errors, and provide a road map for your return.

Today's premier tax programs offer three data entry options. Using the interview feature is like having a financial professional ask you tax-related questions and fill out the correct forms based on your answers. The second alternative—referred to as the shoebox, organizer, or other name—presents a list of tax topics or tax documents (1099's, W-2's, and so on) and takes you to the line where they belong. Of course, every product lets you enter data directly onto the appropriate forms and schedules.

HELP APLENTY

All the products reviewed here offer help—but in varying degrees. The simplest provide only program help and IRS instructions; the best add interpretations of tax law. Simply Tax offers still more: on-line tax guidance and tips from Ernst & Young. Kiplinger TaxCut does the same with information from its own experts. TurboTax's Interview provides limited advice from its Tax Advisor.

Nontax help is available too, in the form of tools to aid in background calculations and documentation. Every tax program has at least a pop-up calculator and some kind of notepad; most of the latter attach your notes directly to the relevant lines in your forms and schedules. If a field requires an offstage inventory of supporting numbers, most programs let you link a related list to it. Some go further, including miniworksheets for more focused itemizations.

Every tax package performs a final review of your return, producing a list of errors and omissions; some do more than that. TaxCut does some auditing as you enter data, popping up a dialog box if a number looks out of line. TurboTax now has a four-part review process that includes a deduction finder. Personal Tax Edge (like many others) compares the results of filing jointly versus separately for married couples, compares the final totals to U.S. averages, and suggests possible ways to reduce the tax obligation.

Though we were unable to test final filing alternatives in the head-start editions

Our Contributors: KATHY YAKAL is a frequent contributor to *PC Magazine*. TED STEVENSON was the senior associate editor in charge of this story, and AMARENDRA SINGH was the project leader.

we reviewed, most tax software lets you print out either the abbreviated 1040PC format or the standard forms and schedules. (For information on how and why to file your taxes electronically, see the sidebar "Ten Things You Should Know About Electronic Filing.")



BRIGHT INTERFACES

With a complex application like tax software, the user interface can make or break a product. Several of the Windows-based packages reviewed here have undergone major face-lifts this year. Block Financial Software has toned down the new look introduced in last year's TaxCut, resulting in a more usable product. Intuit has developed what we feel is the best interface ever to appear in a tax product. Personal Tax Edge hasn't evolved as much (with the exception of the new Tax Guide), but the simplicity of its interface should still appeal to many users. 4Home Productions built a completely new screen display for Simply Tax that's rather busy and confusing but far superior to last year's model.

All Windows-based tax programs still

FEATURES PLUS

From February 6 through February 10, you can go on-line to discuss tax software with senior associate editor Ted Stevenson, writer Kathy Yakal, and representatives from the software companies discussed in this article. Type GO EXEC from any CompuServe ! prompt.

use pull-down menus, icon toolbars, and buttons, but new navigational aids are being added. For example, three of this year's titles have adopted the now-familiar file-folder tab metaphor that first appeared in spreadsheets a couple of years back.

Is personal tax preparation software for everyone? No. These programs don't include every possible IRS form and schedule and thus can't process some complex scenarios. Furthermore, the depth of background information they offer may not be sufficient for

● TurboTax for Windows

It's like a recurring dream, with the same old horse race and the same two horses—Intuit's TurboTax and Block Financial Software's TaxCut—nose-to-nose at the finish line. Each has walked away with the cup once in the last two years.

This year it's another photo finish, but TurboTax for Windows crosses the line first.

Our choice of TurboTax has as much to do with what you *don't* see as what you do: Intuit's elegant new interface makes you feel as if you're watching a slick presentation rather than doing your taxes. TurboTax's familiar processing power is there, but it's tucked neatly away until needed.

Easy navigation is as important to tax software as cosmetic appearance. Here too, Intuit has made small changes that represent great strides in usability. Supporting forms and schedules are easily accessible during direct data entry, for example, thanks to QuickZoom. And it's much easier to switch between forms and EasyStep.

Though it works only with Quicken

4 for Windows, TurboTax's TaxLink moves the market much closer to full integration of personal financial software and tax preparation products.

TaxCut challenges TurboTax in almost every area: Its revamped Navigator is a clear, interactive blueprint of your return. Q&A displays both questions and background information on-screen. The "roving I" offers quick access to additional tools and information. TaxCut now provides clear pointers to your next move at every step.

Both these perennial favorites do an exemplary job of simplifying every element of tax preparation. But where TaxCut has tightened and clarified since last year, TurboTax has moved us a step closer to the next, exciting generation of software.

For those reasons, taxpayers with a cautious temperament may be better off with professional tax help. On the other hand, if you're already preparing your own taxes manually, you'll likely reap savings of both time and money by using a tax preparation program. If you've had them prepared professionally in the past, you might consider trying both methods and comparing the results.

TESTING WRINGER

To test the competence and usability of the products reviewed here, we used them to process three tax returns of varying complexity—and found, incidentally, that the products were capable of handling much more. In the first scenario, a couple whose W-2 income totaled \$50,000 received taxable interest, paid home mortgage interest, and contributed to IRAs and charity. The second involved a married couple with one child. Both parents

were self-employed, earning a total of \$75,000. They rented their home and a small office, paid day-care expenses, and had paid estimated taxes. In the third, a married couple with three children earned \$140,000 between his W-2 income and her business. They sold stocks during the year to pay some high medical expenses, took a loss on their rental cabin, and had child-care costs.

These scenarios give you—as well as us—a concrete index of the levels of complexity that today's tax preparation programs can comfortably handle. In fact, those with the confidence to tackle still more complex returns will find that most of the products we review can manage those too with aplomb.

Though the U.S. tax laws—and the computer software industry—are in a constant state of flux, you might find a small harbor of calm by settling in once a year with one of the products reviewed here.

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SOFTWARE Personal Tax Preparation

Suitability to Task: Personal Tax Preparation

Tax preparation software can help eliminate much of the frustration of doing your taxes by guiding you through your tax chores and preparing the actual returns. We looked at seven tax programs (four of which have both DOS and Microsoft Windows versions), examining their preparation tools, the guidance they offer, their accuracy, and their final output. In each category, we evaluated each package's *power* (comprehensiveness of features) and *ease* of use.

We look carefully at the tax preparation capabilities of each program. If a product includes complete representations of the most commonly used forms, calculates them accurately, and guides users in

filling out supplemental forms and schedules where required, we have rated it at least fair. To garner a higher score, a program has to go beyond that, importing financial data from a

variety of money management programs and offering automatic links to support forms, schedules, and worksheets. A top-rated program must also provide both an interview option for data entry and an electronic organizer (or *shoebox*) for classifying miscellaneous income and expenses. Beyond

that, good programs should also have helpful utilities such as a pop-up calculator, a notepad, or bookkeeping tools.

In evaluating each program's **guidance** elements, we asked, Are the explanations of tax law available at the precise time a user is likely to need them? Are they easy to find? And—most important—are they understandable and thorough? A high score indicates that the program's designers were able to make the IRS's often incomprehensible instructions comprehensible. The best programs help you pare down your tax debt by offering tax-saving suggestions. They also let you explore alternative tax-filing options by building "what if" scenarios that compare your return against U.S. averages. Top-scoring programs also let you compare the results of filing your return separately against filing it jointly with your spouse. In addition, programs that score well also offer ways to audit and review your completed

SUITABILITY TO TASK

Product Name	Suitability to Task	
	Power	Ease
Preparation	EXCELLENT	GOOD
Guidance	GOOD	FAIR
Filing	FAIR	POOR

return checking for any omissions or entries that could possibly trigger an IRS audit.

Our **filing** task involves a program's

ability to create IRS-approved forms on a variety of printers without requiring additional software or font cartridges. Printing IRS replica forms is a real advantage. Top-ranked programs also offer an easy path for electronic filing and do not charge any fee beyond the IRS filing fee.

AM Software Inc.

• AM-Tax Personal 1040

ALL REVIEWS BY KATHY YAKAL
Preparing taxes is a dreaded task for most people: The process can all too often be slow, complex, and confusing. But AM Software's AM-Tax Personal 1040 (\$39) proves that the software supporting the process doesn't have to be. Now in its tenth season, this DOS-based title has built its reputation on speed, simplicity, and accuracy.

AM-Tax doesn't have numerous data entry options, detailed explanations and help files, or the navigational and functional ease of a graphical interface. But if all you really want is a reliable, few-frills electronic tax preparer, AM-Tax is a safe bet. It's also a good choice if your com-

puter can't accommodate the hardware requirements of Windows-based tax software.

BREEZING THROUGH

Entering your data is easy and straightforward: Just go to 1 of the program's 69 forms, schedules, and worksheets and start entering. Supported fields are marked with an asterisk, and calculated fields, a "C." Unlike packages such as TurboTax and TaxCut, AM-Tax Personal 1040 will not import data from other programs. But a new feature in this year's release will let you maintain a tax history for up to five years.

All navigational keystrokes are supported in AM-Tax. Scrolling is not, but the PgDn and PgUp keys move you around pretty efficiently. Use the function keys to jump to and from supporting doc-



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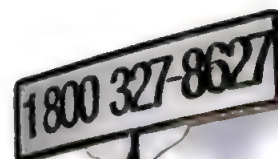
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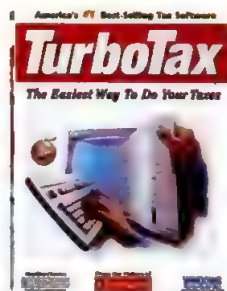
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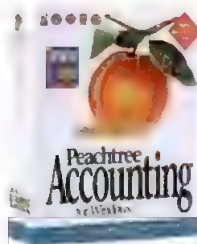
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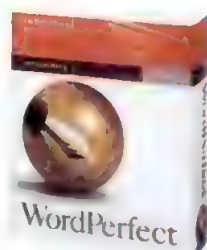
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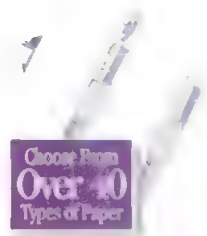


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Personal Tax Preparation



AM-Tax Personal 1040's pop-up options menu gives you quick access to program operations.

uments, override and recalculate data, access the state return, get help or a list of forms and options (calculator, tax summary, and so on), save, and print. The Review Return feature displays a list of forms you've worked on, which saves time when revisiting screens. Another handy feature is that every screen keeps a running tally of your tax obligation and tax bracket.

DON'T WANNA HOLD YOUR HAND

When it comes to tax advice and money-saving tips, AM-Tax falls behind most of the pack. Program help is thorough, and IRS instructions are also available—although no interpretations of IRS-speak are provided. The program does let you create “what if” scenarios, and you can view a constantly evolving summary of your tax obligation (which is where your five-year data appears).

SUITABILITY TO TASK

	AM-Tax Personal 1040	
	Power	Ease
Preparation	Fair	Good
Guidance	Fair	Good
Filing	Good	Good

This year's edition of AM-Tax provides enhanced detail for working on more complicated tax returns. Other new features include three forms and one schedule, an option for joint reporting on Schedules C and F, and the option to handle more depreciable assets and rental properties. And as always, you can file your taxes by printing out and mailing in either the condensed,

IRS-approved 1040PC form or the standard forms and schedules.

If you want or need step-by-step walk-throughs, Windows' easy navigation, or more than basic instructions, AM-Tax Personal 1040 clearly is not the best title. But for people with older PCs, AM-Tax is the tax preparation program of choice: It will even run off of floppy disks (minus the help and audit functions). And for those of you who just want to burn through your tax return with minimal interven-

tion, there's nothing better than AM-Tax.

► **AM-Tax Personal 1040.** List price: \$39. AM Software Inc., P.O. Box 25010, Kansas City, MO 64119; 800-859-8537, 816-741-7848; fax, 816-741-1517.

Circle 444 on reader service card

Block Financial Software

• TaxCut

Kiplinger

• Kiplinger's TaxCut

Block Financial Software has done it again with the 1994 versions of TaxCut for DOS and TaxCut for Windows (head-start version, \$9.95 street; final version, \$39.95 street). TaxCut has been one of *PC Magazine's* top two tax packages for several years running, and this year's releases carry on the tradition. Block refined the new Windows version by toning down the colorful interface, tightening the operation to make it clearer and cleaner, and adding some snazzy new navigational options. These improvements widen the gap between this version and its DOS sister, but features remain similar in both.

Kiplinger's TaxCut, an enhanced version of Block's package, is also available. Now in its third year, this product incorporates expert tax advice from Kiplinger and is available for DOS and Windows. You can order the software only from Kiplinger; the federal edition is \$39.95, and the state editions sell for \$24.95 each. The head-start version sells for \$11.95.

RETURNING TO RETURNS

Like most packages, TaxCut allows you to import existing financial information—but it gives you greater flexibility than other packages. You can import data from last year's TaxCut or TurboTax, and you can also bring files in via .FOX, .TAX, or .TXF formats. As for entering current information, TaxCut gives you three options: interview (here called Q&A), shoebox, and direct data entry.

If Q&A is your preferred method, see the list box that displays 12 primary topics such as “If You Are Self-Employed.” A separate box lists subtopics within that section. Clicking on Start Q&A will take you to a series of screens that offer background information and ask specific questions. The program will automatically enter your answers on the appropriate forms.

The opening Q&A screen also contains buttons marked Go to Form and Find Topic; the latter provides an alphabetical list of tax-related subjects. Select one and you can jump either to the actual form or to the matching section in the Q&A. You can also access IRS instructions and program help from Q&A.

The Shoebox, found in the Forms menu, lists miscellaneous topics. Here too, TaxCut will carry you to the appropriate area of your return.

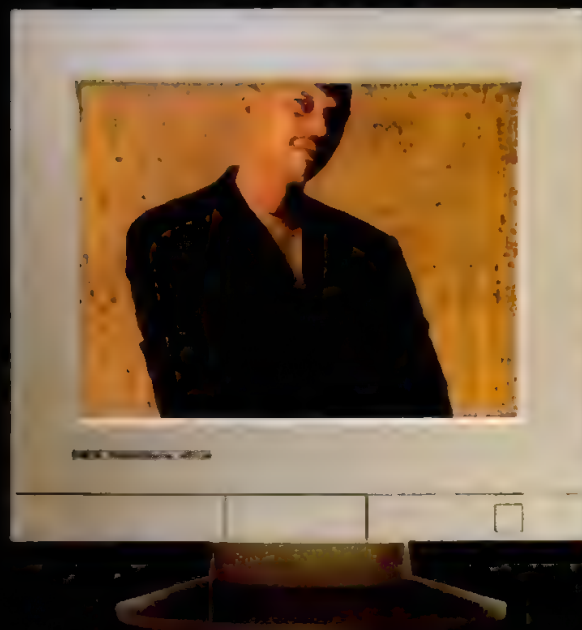
If direct data entry is more your style, you may want to use a new feature in the Windows version: the “roving I,” a graphical “I” that remains on-screen during the process. Clicking on this icon will bring up much of TaxCut's help (though you can still use standard, searchable help), let you flag an entry as tentative for later review, or let you create a detail list.

When you start crunching numbers, you should bear in mind that clicking on Instructions will give you IRS instructions for the form you're using. And if you need a less formal reading than the IRS's, go to Explain Form. Ctrl-F4 takes you back to the form you were working in, but a glitch in the head-start edition caused the original form to shrink. This will be corrected in the final version, according to Block.

No matter which method you choose to complete your return, TaxCut offers a constantly updated progress report that has both summary and detail views. The summary displays both a graph and a

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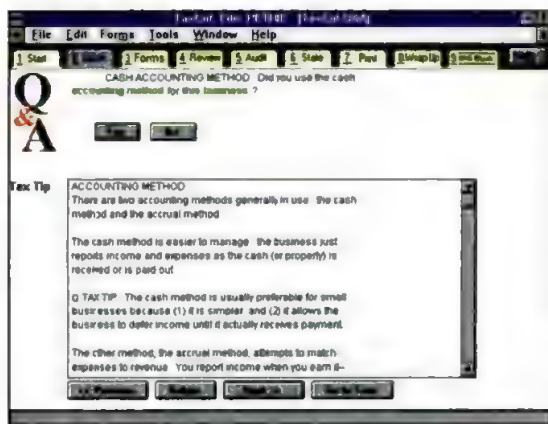
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Personal Tax Preparation



Your navigational options in TaxCut are made clear by on-screen buttons and tabs.

breakdown of actual figures illustrating current income and tax tallies. The detail view lists all entries made on your return, with the option to jump directly to them.

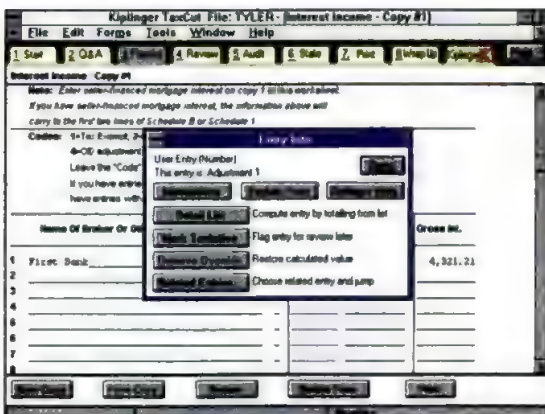
SMOOTH SAILING

Getting around is definitely easier in this year's TaxCut for Windows. Block aban-

SUITABILITY TO TASK		
TaxCut		
	Power	Ease
Preparation	EXCELLENT	GOOD
Guidance	EXCELLENT	EXCELLENT
Filing	EXCELLENT	EXCELLENT

doned the cartoon-strip Navigator for a simpler look: The opening screen now uses simple tabs that take you to the program's nine main areas.

In addition to cleaning up the interface, Block has streamlined navigation. For example, at any point in the Q&A or forms entry options, you can move back



Click on the "roving I" in Kiplinger's TaxCut (or Block Financial's TaxCut) and a dialog box displays myriad options.

to the Navigator (or to other core features, such as the Auditor) by clicking the Return button. Find Topic is available in a pull-down menu if there's no on-screen button. And topics you've visited in the Q&A but not completed are marked with a different symbol than those you've finished.

The new "roving I" feature also offers navigational help. As you move through forms entry, clicking on the "I" opens a small box containing several buttons. The Related Entries button will take you to a list of forms and schedules linked to that line. You can either move there or revisit other forms listed in the box.

Accommodating different user styles is another of TaxCut's strengths. The program designers have taken pains to offer more than one way to move through your return in both versions. For example, you can jump to related entries by hitting Ctrl-J or selecting Jump to Related from the Forms menu. Ctrl-V or Previous Form takes you back.

MR. TAXMAN

Many of us have anxiety about getting everything right on our tax return. This year's TaxCut offers more help than ever to make sure you do so. TaxCut's Auditor, for example, is always with you. If you've made an entry that seems unusual, a question box will pop up. Auditor also scrutinizes your completed return for errors, omissions, and inconsistencies; clicking on any line number box will

move you to the relevant form for corrections. TaxCut's extensive tax-planning section helps you strategize, using tools such as "what if" worksheets, a five-year summary, and information on filing an amended return. Miniworksheets help document final totals on the 1040. And now, thanks to H&R Block's 1993 acquisition of MECA, TaxCut customers can call local H&R Block offices to ask tax-related questions. If you're audited, a Block representative will ac-

company you to the audit.

When you're ready to file your polished return, you can print out and mail in either the condensed, IRS-approved 1040PC form or the standard forms and schedules. Block thoughtfully includes an uninstall utility to remove the program—but not your data—from your PC.

TaxCut didn't take the giant step it did with last year's Windows version, but the truth is that it didn't need to. By toning

SUITABILITY TO TASK		
Kiplinger's TaxCut		
	Power	Ease
Preparation	EXCELLENT	GOOD
Guidance	EXCELLENT	EXCELLENT
Filing	EXCELLENT	EXCELLENT

down some of the navigational elements that caused minor confusion last year, yet retaining its reliability, depth, and usability, TaxCut has proved once again why it's one of the top tax programs available.

► **TaxCut for DOS, TaxCut for Windows.** List price: *Head-start version*, \$9.95; *final version*, \$39.95. Block Financial Software, 55 Walls Dr., Fairfield, CT 06430; 800-288-6322, 203-256-5000; fax, 203-255-6300.

Circle 448 on reader service card

► **Kiplinger's TaxCut for DOS, Kiplinger's TaxCut for Windows.** List price: *Head-start federal version*, \$11.95; *final federal version*, \$39.95; *final state versions*, \$24.95 each. Kiplinger, 1729 H. St. N.W., Washington D.C. 20006.; 800-235-4060.

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4Home Productions

• Simply Tax for Windows

4Home Productions' mantra while reconstructing Simply Tax for Windows (\$69.99; free to registered users of the head-start version) may well have been "If we rebuild it, they will come." After practically giving away the first version of Simply Tax last year, 4Home Productions (a division of Computer Associates International) started from scratch to produce this year's release. It combines previous content with a completely overhauled look and feel and a meatier guidance system. But these welcome cosmetic and substantive changes are offset by an over-

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PC MODELS

See inside for complete specs. Full Profile PCs available with 2 extra slots, a 5.25" front-accessible bay and a PCMCIA bay.

Venturis Slimline

Model	Processor	Price
433sx	486SX/33MHz	\$1,079
466	486DX2/66MHz	\$1,299
4100	486DX4/100MHz	\$1,799

Celebris Slimline

560	Pentium/60MHz	\$2,199
590	Pentium/90MHz	\$2,499

HARD DRIVES

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Upgrade to 1GB SCSI	\$849

RAM

Venturis	4MB	\$200
	16MB	\$700
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	16MB	\$700

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15" Multi-frequency	\$449
17" Multi-frequency	\$999
21" Multi-frequency	\$1,999

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DECLaser 5100



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■ Less Is More: *The IRS Gears Up to Slim Down*

By Kathy Yakal

The Internal Revenue Service has begun the Herculean task of streamlining its antiquated system of manually processing income tax returns. And *Herculean* is no exaggeration: According to a U.S. General Accounting Office report, by September of 1994, the IRS had received 113.4 million individual income tax returns for the 1993 tax year. That's a lot of returns. With the population—and thus the volume of tax returns—continuing to grow, change was inevitable.

The passage of the North American Free Trade Agreement (NAFTA) in 1993 has also played a role in the IRS's decision to update its system. For the IRS to comply with NAFTA regulations, approximately 94 percent of tax remittances have to be collected via electronic funds transfer (EFT) by the year 2000. With only about a 3 percent EFT remittance rate this past year, the IRS has a long way to go.

To address these issues, the IRS has developed a three-pronged strategy for receiving and processing tax and payment information electronically. The plan is to receive about 50 percent of individual returns electronically, process 100 percent of payments through a third-party transmitter, and implement optical character recognition (OCR, or as the IRS calls it, "image character") technology for processing the remaining data. The target date for implementing this ambitious plan is 2001.

ONE FORM IN FRONT OF THE OTHER

Parts of the IRS's new procedures are already in place. More than 15.4 million filers (both business and personal) posted returns electronically in

1994. And according to the GAO report, electronic filing and TeleFiling (submitting a 1040EX via touch-tone phone) increased slightly in

Ten Things You Should Know About Electronic Filing

1. Electronic filing is not paperless. You must still submit any W-2's and 8453's to the processing center.
2. Your refund is deposited in your account within about 2 weeks, 3 to 6 weeks sooner than with standard filing.
3. If you owe money to the IRS, you can file a 1040V electronically (most tax preparation firms perform this function; it is not available through personal tax software).
4. Some states let you submit both federal and state returns in one transmission.
5. Electronic returns must contain some information paper returns don't require. Personal tax software shows you what's needed.
6. The Override function in tax software should be avoided; it sometimes stops the flow of calculated entries, which may result in arithmetic errors.
7. A modem is not necessary for sending electronic filing information to a processing center. Floppy disks or printed forms containing your return information can be sent instead.
8. The IRS electronic receipt is the only absolute proof that your return was received and on-time.
9. Electronic filing significantly reduces data entry errors. Printed forms are hand-keyed at the IRS.
10. Electronic filing is not free. The fee charged by a processing center is typically about \$15.

1994. In addition, certain types of payments were handled using third-party payment processors for the 1993 tax year.

The next and possibly most important step in this ambitious automation process, however, is the introduction of a standardized, machine-readable tax form—the 1040S. It will be a hybrid of the current 1040A and 1040 with Schedules A and B and should roll out for experimental purposes in 1995.

According to the IRS, this form (which will be fully available in 1997) could be used by the estimated 40 to 45 percent of the tax-paying public who don't file returns electronically.

As for OCR, Loral Federal Systems was awarded the contract to develop the new character recognition technology. At press time, Loral was hard at work, and representatives from the company indicated that bar code reader technology may be included in its systems. If Loral is able to develop this, computers at the IRS could recognize which software package was used to prepare each return and could therefore read the return accurately.

BACK TO THE FUTURE

The IRS estimates that half of currently filed U.S. tax returns are prepared using a computer. And the IRS hopes that percentage will continue to increase. The two filing methods the IRS prefers are electronic filing and the abbreviated 1040PC, but handwritten returns will still be accepted.

So where does this leave tax preparation software? As it stands now, tax software companies are at a real advantage, because most of them already

provide tools for two of the three filing options. And if the optical character readers being developed by Loral are indeed able to scan the returns generated by tax software accurately (a possibility that's still uncertain), tax software manufacturers can only benefit.

Overall, your income tax filing process will change little as the IRS streamlines. Perhaps the biggest difference will be that you may get any refund you're due a little faster. □

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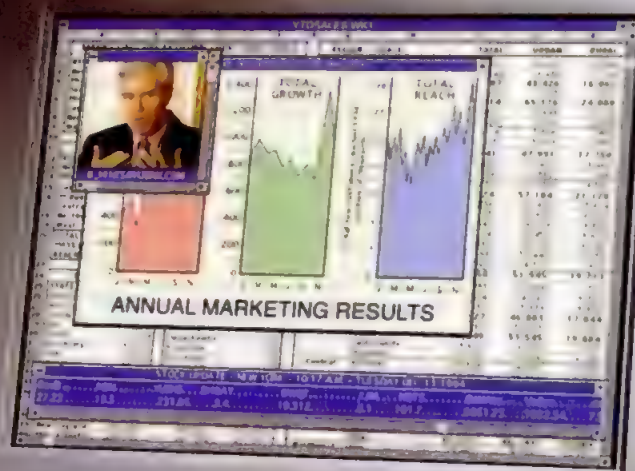
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CIRCLE 157 ON READER SERVICE CARD

$\mathcal{G}(H) = \{g_{11}, g_{12}, \dots, g_{1n}, g_{21}, g_{22}, \dots, g_{2n}, \dots, g_{m1}, g_{m2}, \dots, g_{mn}\}$ and $\mathcal{G}(H)$ is called

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Personal Tax Preparation

ly busy, sometimes confusing interface and some glitches in the head-start version. Still, there's a lot to like about this year's offering.

EYES ON THE PRIZE

Many of the functional elements of the top tax titles are included in the new Simply Tax, although it's still a bit shorter on forms and schedules. Data can be import-

We also discovered some irritating glitches in the head-start version. For example, jumping back and forth among topics and forms—and between forms and the Interview—is difficult. If you click on a program icon within a document, the form shrinks and does not resize when the requested dialog box opens. Also, newly opened forms or boxes do not replace the previous display. All of these are distracting, but 4Home says they will be fixed in the final version.

HELP YOURSELF

Even though Simply Tax is still quirky, 4Home need not apologize for its prolific help system. You have access to three levels of guidance—an explanation of the current element, verbatim IRS instructions, or insight from the Ernst & Young Tax Advisor—and program help. You're also provided with miniworksheets in the direct data entry option and right-mouse

Simply Tax's Validate function scans your return for simple errors and omissions.

button support for overriding fields and jumping to required forms.

Other pluses include the Validate function, which scans your return for simple errors and omissions. Tax Savings, expected to be included in the 1994 final edition, will comb your entries for com-

monly overlooked deductions. And Audit Alert will compare your data to national averages. When you're done, you can file your taxes by printing out and mailing in either the condensed, IRS-approved 1040PC form or the standard forms and schedules.

The overhauled Simply Tax is quite simply a diamond in the rough. The package has a long way to go before its stability, navigational ease, speed, and usability match the best of the bunch—but its new beginning shows promise.

► **Simply Tax for Windows.** List price: \$69.99; free to registered users of the head-start version. 4Home Productions (a division of Computer Associates International), One Computer Associates Plaza, Islandia, NY 11788; 800-773-5445, 516-342-2000; fax, 516-342-6854.

Circle 447 on reader service card

Parsons Technology Inc.

● Personal Tax Edge

WordPerfect, the Novell Applications Group

● TaxSaver

This year's tax roundup includes two nearly identical products with different names from different companies: Personal Tax Edge for DOS or Windows (head-start and final versions, \$29; final version only, \$19) from Parsons Technology and TaxSaver for DOS or Windows (head-start version, \$34.95; final version is free to registered users) from WordPerfect, the Novell Applications Group. Now we'll try to explain. Parsons was forced to license PTE to WordPerfect, which now sells the package as TaxSaver. Intuit also now has the license to this product, because it purchased Parsons; it has not put a third version on the market, though. The two available programs are so similar that much of the time we'll refer to them together (as PTE/TaxSaver).

This year, PTE/TaxSaver is sporting a new help and navigational aid called Personal Tax Guide in PTE and Tax Coach in TaxSaver. Still, it continues to offer a comfortable balance of simplicity and tax-processing power. The Interview option, though comprehensive, remains one of PTE/TaxSaver's cruder elements; the boilerplate Tax Organizer (similar to the shoebox feature in other products) isn't as all-encompassing as its competitors'. But slow, careful growth, a fine on-line help system, and the low price make PTE/TaxSaver an attractive, reliable tax product.

STANDARD CHOICES

Parsons first released the graphical version of PTE two years ago, but the DOS and Windows products have maintained similar feature sets. Both import financial data directly from MoneyCounts, PTE,

SUITABILITY TO TASK

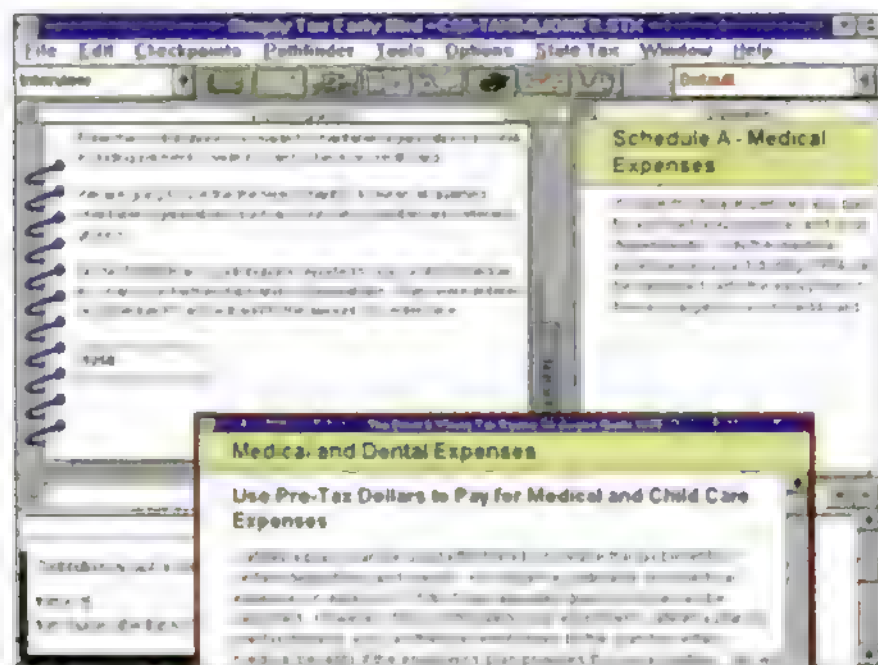
Simply Tax for Windows

	Power	Ease
Preparation	GOOD	FAIR
Guidance	EXCELLENT	GOOD
Filing	GOOD	GOOD

ed directly from last year's version or from Simply Money. And like some other packages, Simply Tax lets you choose how you want to prepare your return: via direct data entry, the Interview feature, or the catch-all Shoebox.

A new feature is the Pathfinder, a pop-up box that contains tabs such as History (a list of documents you've visited during the current session but not necessarily opened), Forms, Shoebox (a list of miscellaneous tax topics), Interview Elements, Active (a list of documents you've worked with during current session), and Bookmark (a list of places you've earmarked on forms and schedules).

Although Simply Tax has simplified navigation, it still has some interface problems. Moving through the Interview is not difficult, but keeping your eye on the right place in the rather cluttered screen is quite challenging.



Although the screen is somewhat cluttered, the handy expertise of Ernst & Young available throughout Simply Tax is a welcome addition.

45 minutes ago you were a **mere mortal**. Now you're drawing flowcharts, organizational charts, even space plans, and someone says, "Geez, I didn't know **You** could do all that." And **You** just take a sip of your coffee.



says, "Geez, I didn't know **You** could do all that." And **You** just take a sip of your coffee.



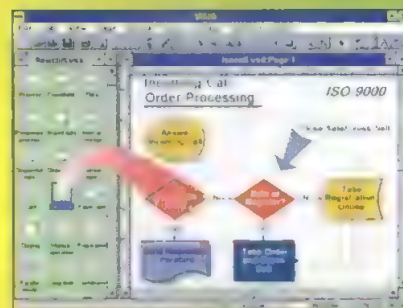
Forget the flowing cape and the chrome underwear. You don't need them to be a superhero. All you need is



Visio is chock-full of over 750 SmartShapes and 22 stencils. So what in the heck does this mean to you? Well pardner, it means you can draw space plans. You can draw block diagrams. You can draw maps. You can draw flowcharts. You can draw project timelines. You can draw till it hurts.

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► **SUMMARY OF FEATURES**

Personal Tax Preparation



Products listed in review order

■ = YES □ = NO

General Features

List price

User interface

Context-sensitive help

Professional version available

CD-ROM version available

Software Features

Interview option

Shoebox/organizer option

"What if" analysis

Finance/tax packages from which product automatically extracts data

File-import formats supported

Tax Help

Provides on-line IRS instructions

Interprets IRS instructions

Provides on-line tax-saving tips

Provides tax planning for 1995

Includes minworksheets

Offers expert advice

Compares return with national averages

Looks for errors and omissions

Flags possible IRS audit situations

Checks for unclaimed deductions

Forms Preparation

Number of forms, schedules, and worksheets

State versions available

Cost per state version

Filing

Prints IRS replica forms on laser and dot matrix printers

Supports electronic filing

Supports filing in 1040PC format

Technical Support

Support via phone/fax

On-line forum

N/A—Not applicable. The product does not have this feature

AM-Tax Personal 1040

TaxCut, Kiplinger's Tax Cut

Simply Tax for Windows

Personal Tax Edge, TaxSaver

TaxPerfect Personal 1040

TurboTax for DOS, TurboTax for Windows

Head-start and final versions, \$44.00, final version only, \$39.00

TaxCut: Head-start version, \$9.95, final version, \$39.95 (estimated street price)
Kiplinger's TaxCut: Head-start version, \$11.95, final version, \$39.95

\$89.99

PTE: Head-start and final versions, \$29.00, final version only, \$19.00
TaxSaver: \$34.95

\$79.95; upgrade, \$39.99

\$69.95

DOS

DOS, Windows

Windows

DOS, Windows

DOS

DOS, Windows

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AM-Tax Personal 1040 (1993)

TaxCut

Simply Money 2.0, Simply Tax (1993)

MoneyCounts 7.x for DOS, MoneyCounts 1.0 for Windows, Personal Tax Edge, Tax Mate

None

Windows version: Quicken 4 for Windows, TurboTax (1993), DOS version: TurboTax (1993)

None

ASCII, FOX, PRN, TAX, TXF

ASCII, PRN, .TXF

ASCII, TXF

N/A

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PTE, 63; TaxSaver, 79

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DOS version, 100, Windows version, 144

AR, AZ, CA, CO, CT, DC, GA, IL, IN, KS, KY, MA, MD, MI, MN, MO, NC, NJ, NY, OH, OK, PA, SC, VA, WI

AZ, CA, CO, CT, DC, FL, GA, IL, IN, MA, MD, MI, MN, NJ, NY, OH, OK, PA, TN, VA, WI

AZ, CA, CO, CT, FL, GA, IL, IN, MA, MD, MI, MN, NJ, NY, OH, OK, PA, VA, WI, UT

PTE: DC and all states except AK, FL, HI, NV, SD, TN, TX, WA, WI, WY; TaxSaver: DC and all states except AK, NV, SD, TX, WA, WY

None

DOS version: DC and all states except AK, NV, SD, TX, WA, WY; Windows version: AL, AZ, CA, CO, CT, DC, GA, IL, IN, LA, MA, MD, MI, MN, MO, NC, NE, NJ, NM, NY, OH, OK, OR, PA, SC, UT, VA, WI

\$29.00

\$29.95

\$24.95

PTE, \$19.00; TaxSaver, \$24.95

N/A

\$24.95

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and TaxMate (a "lite" version of Personal Tax Edge with fewer forms) and accept files in .TXF format. Their 63 forms, schedules, and worksheets can be filled out via the Interview option, direct data entry, or the Tax Organizer; the last requires extensive editing of the boilerplate list of built-in documents. The Tax Guide/Tax Coach is a dialog box that outlines the program's seven tax-preparation steps. Click on one and Tax Guide will walk you through each substep.

PTE/TaxSaver's Interview framework hasn't evolved much over the last two years. It leads you through every element

CLEAR, ACCESSIBLE GUIDANCE

PTE/TaxSaver offers numerous ways to document each entry and to get help. You can, for example, attach a generic note or a more specific Bookkeeper to most lines (the latter lets you enumerate details subsumed under an entry).

Whether you're using Interview or direct data entry, you have fast access to Tax Tips—context-sensitive explanations of the current line combined with advice on how best to handle a specific tax situation.

On-line IRS instructions explain points of tax law and direct you to related IRS publications. And program help is available through the Help menu.

Additional tools—a simple math calculator and a more complex depreciation calculator—assist with any computations your tax return may require. PTE (but not TaxSaver) also includes Interest Vision SE, a utility that calculates long-term interest and principle on loans, annuities, sav-

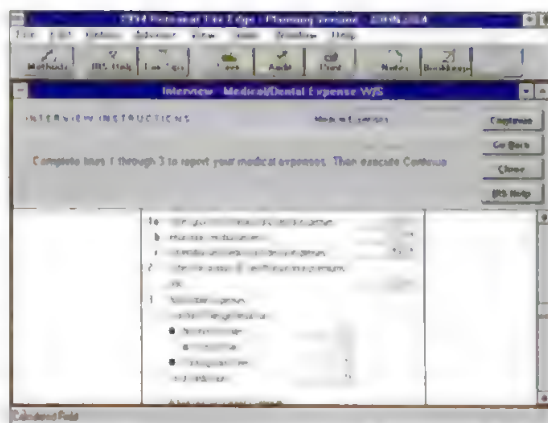
ings, and investments and can also generate amortization and accumulation schedules.

CLEANING UP

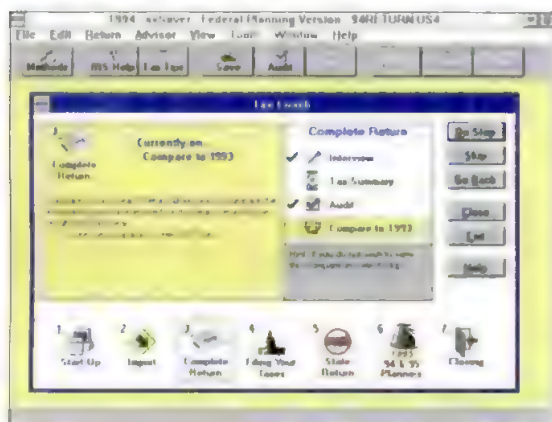
PTE/TaxSaver offers two audit options and a handful of tools designed to help you plan future tax strategies: Audit Report simply lists errors and omissions and flags possible problems; Review Audits takes you directly to the line in question for consideration. Tax at a Glance provides a snapshot of your completed return and allows "what if" musings. Review W-4 may point to wiser employer tax withholdings; Tax Savers offers personalized suggestions for more advantageous planning.

With PTE/TaxSaver, you can file your taxes by printing out and mailing in either the condensed, IRS-approved 1040PC form, the 1040X form, or the standard forms and schedules.

Though perhaps not as feature-packed or elegant as the premiere tax



Personal Tax Edge's Interview, though comprehensive, requires you to enter a large portion of your data directly.



WordPerfect's TaxSaver uses Tax Coach (similar to Personal Tax Edge's Tax Guide) for orderly tax preparation.

of your return but asks only a couple of basic questions in each before dumping you into the form or schedule for direct data entry. On-screen directions tell you exactly which lines to fill in before returning to the Interview. If you exit Interview without finishing, however, you won't be taken back to your stopping point when you resume. Completed topics are checked off in the list, but if you haven't fully completed a topic, it won't be checked.

The overall interface in PTE/TaxSaver is so clean and understandable it's almost spare. Pull-down menus are brief but adequate, and the toolbar contains the most critical, often-used icons.

SUITABILITY TO TASK

	Personal Tax Edge	
	Power	Ease
Preparation	GOOD	GOOD
Guidance	EXCELLENT	EXCELLENT
Filing	GOOD	GOOD

SUITABILITY TO TASK

	TaxSaver	
	Power	Ease
Preparation	GOOD	GOOD
Guidance	EXCELLENT	EXCELLENT
Filing	GOOD	GOOD

find itself head-to-head with the market leaders.

► **Personal Tax Edge for DOS, Personal Tax Edge for Windows.** List price: *Head-start and final versions*, \$29; *final version only*, \$19. Parsons Technology Inc., One Parsons Dr., P.O. Box 100, Hiawatha, IA 52233; 800-223-6925, 319-395-9626; fax, 319-395-7449.

Circle 445 on reader service card

► **TaxSaver for DOS, TaxSaver for Windows.** List price: *Head-start version*, \$34.95; *final version, free to registered users*. WordPerfect, the Novell Applications Group, 1555 N. Technology Way, Orem, UT 84057; 800-451-5151; fax, 801-228-5077.

Circle 446 on reader service card

Financial Services Marketing Corp.

• TaxPerfect Personal 1040

TaxPerfect Personal 1040 (\$79.95; \$39.99 for registered users of past TaxPerfect versions) has always lagged behind its

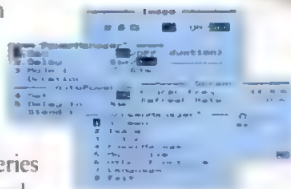
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Personal Tax Preparation



TaxPerfect's pull-down menus and clear screen design make filling out your tax returns fairly straightforward.

competitors in interface design, on-line guidance, and data entry options. In an attempt to catch up, Financial Services Marketing Corp. completely revamped the interface in this year's version. The new look certainly enhances usability, but TaxPerfect still can't compete with other DOS-based tax preparation software—especially considering the bugs we encountered in the head-start edition. The program's speed and simplicity may, however, appeal to users who just want electronic tax forms and don't need help preparing their returns.

ONE-WAY STREET

TaxPerfect can't import data from other tax programs or personal finance packages, but data entry has been improved in this year's version. In the past, you had to enter data on a special screen; now you can enter data directly on any of TaxPerfect's 91 forms, schedules, and worksheets. Numeric fields that contain a yellow zero require a supporting form or schedule, but you can easily override these. Pressing Alt-R pops up a box displaying the document required; unfortunately, TaxPerfect's automatic jump wasn't working in the Head-start edition we reviewed.

Interview and shoebox data entry options aren't offered in TaxPerfect, but pull-down menus and function key descriptions do provide instructions for program operation. This year's version is missing the on-screen running tally and the list of already processed forms, but a function key will display them. TaxPerfect now also supports limited mouse

operations—not including navigation. Consult the program help for an explanation of navigational options.

Guidance for puzzled taxpayers has never been TaxPerfect's forte, though the 1994 head-start and final versions both contain IRS instructions. And some help can be found in the program's forms list. To see an explanation of the highlighted document, click F10; clicking F9 will display a tree diagram illustrating the forms and schedules related to each document.

THE HOME STRETCH

TaxPerfect offers several features that will help you detail and thoroughly document your return before printing: Data-Check briefly scans your entries for simple omissions and errors. The Notepad helps you keep track of detail lists and other off-stage documentation, although you can't link notes to individual lines or forms. The standalone depreciation calculator can compute simple depreciation equations. Running TaxPerfect in tax-planning instead of tax-preparation mode lets you explore "what if" projections. And the Tax Calendar file lists important dates for tax reports and payments.

TaxPerfect's head-start edition suffered from many unexplained glitches. For example, we were unable to save without naming a data directory and could not print a return in IRS-approved

SUITABILITY TO TASK		
TaxPerfect Personal 1040		
	Power	Ease
Preparation	GOOD	FAIR
Guidance	POOR	GOOD
Filing	GOOD	GOOD

format. The depreciation calculator locked up in one test, and in at least one form (2441) we had to supply information that should have automatically carried over.

Admittedly, TaxPerfect's new interface and additions are big steps forward for the product. But even if Financial Services Marketing patches the program's holes by final release, recommending this

title to anyone but former users and those who need only a bare-bones tax preparation program is tough.

► **TaxPerfect Personal 1040.** List price: \$79.95; for registered users of past versions, \$39.99. Financial Services Marketing Corp., 500 N. Dallas Bank Tower, 12900 Preston Rd., Dallas, TX 75230; 800-525-5611, 214-386-6320; fax, 214-386-6323.

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Intuit Inc.

● TurboTax for DOS

EDITORS' CHOICE

TurboTax for Windows

As it did two years ago, TurboTax for Windows (\$69.95) has taken a giant step forward—this time by designing the cleanest, most understandable interface ever for a personal tax product. Intuit has also added numerous substantive features, among them Tax Advisor—an enhanced audit feature—and TaxLink, a dynamic connection between TurboTax and Quicken 4 for Windows (Intuit's popular personal finance product).

These careful, balanced cosmetic and functional enhancements make TurboTax for Windows the foremost personal tax preparation program for the 1994 tax year. And although the DOS version hasn't changed as significantly, it is also a solid product.

THE INSIDE LINK

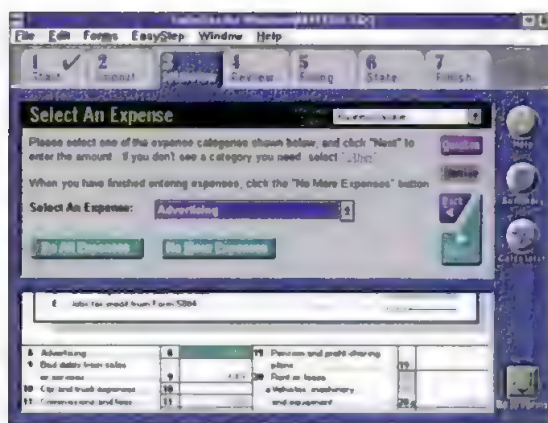
Quicken 4 for Windows users have an unprecedented import tool this year. Using the new TaxLink feature, you can pull Quicken data directly into TurboTax. TaxLink displays a list of transactions and where they went, and previously uncategorized transactions can be assigned to a tax document.

Because Quicken runs in the background when you use TaxLink, new or edited transactions are constantly updated. You can also import financial data from earlier versions of Quicken, last year's TurboTax, or any files in ASCII, .TAX, or .TXF formats into any of TurboTax's 100-plus forms and schedules.

It's taken a couple of years for TurboTax's developers to tame the new Easy-Step (interview) navigation option intro-

SOFTWARE

Personal Tax Preparation



TurboTax for Windows' clean, uncluttered screen belies the impressive tax-processing power within.

duced in 1992, but the pieces have finally fallen into place. Besides being attractive and uncluttered, the revamped interface makes your options and next moves clear at every step.

TAB TEAM NAVIGATION

File-folder tabs guide you through each major program section. Large, nonstandard buttons and icons on every screen let you move forward and backward, itemize, and connect to TaxLink. Chiseled buttons along the side offer help, a summary, and a calculator; they also let you jump to forms. Pull-down menus provide additional navigational help. One of the menus on the Interview screen outlines topics and subtopics.

Direct data entry fans have many new navigational and guidance tools, too. For example, if you're entering data directly and want to return to Interview, click the EasyStep icon and you'll be given a choice between resuming Inter-

form opens. If there are multiple layers, QuickZoom will keep drilling down; if no forms are linked, an itemization worksheet opens. (Alternatively, you can click the Cross-Reference icon to display a list of related forms.) A small box in the upper left corner indicates whether the current line can use QuickZoom or whether it's a direct numeric or text field.

Integrated worksheets further detail your bottom-line figures. Forms can be viewed in various magnifications, from thumbnail to 200 percent. And you can run the Error Summary at any time—without waiting for the final audit—to clean up oversights.

A third data entry option (available in both versions) is TurboTax's File Cabinet, which lists tax-related subjects and documents in alphabetical order. Click on one and you're carried to the appropriate form or schedule's line.

CONSTANT COACHING

Though you probably won't encounter much trouble navigating through TurboTax, there may be places where you'll have questions or will want a sneak preview of how your tax picture is shaping up. TurboTax manages to accommodate all of this in both its DOS and Windows versions.

Tax help and program help are both available. Neither is searchable, though TurboTax Help makes good use of hypertext extensions for additional background in direct data entry. IRS instructions were not available in the head-start edition but should be present in the final release.

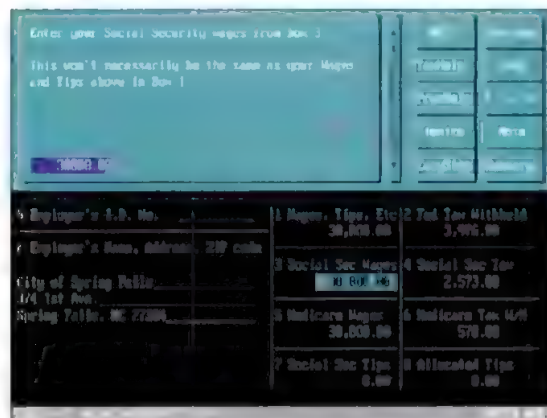
More abundant help is offered in the Interview than in direct data entry mode. Each question posed is brief, but again the hypertext help expounds on selected words and phrases for a more complete explanation. The new Tax Advisor (Windows only) offers guidance on selected screens, but visits from this vir-

tual expert were few and far between in our tests.

The Tax Summary, accessible at any point in TurboTax, displays a constantly updated list of the most crucial bottom-line figures, like Adjustments to Income and Refund or Balance Due. Four tax graphs—Where Your Money Goes, Tax Analysis, Deductions, and Income Sources—offer a visual view of your tax obligation. (Neither Tax Graphs nor the File Cabinet is available when using EasyStep in the Windows product, but both can be accessed via Forms. This glitch should be corrected in the final version.)

COMPLETE CLOSE

Unlike TaxCut, which does a good deal of error checking in the background as you're filling out your return, TurboTax



The EasyStep option in TurboTax for DOS takes your answers and places them in the correct field.

saves much of this task for the end. Its Review function is divided into four areas. Errors and Omissions checks for missing or erroneous information (TurboTax displays a split screen so you can fix the problem immediately). The Audit Flags section answers common questions about IRS audits and alerts you to any flags it's found in your return. Tax Savings Ideas offers advice on ways you might reduce your tax debt. The Deduction Finder

SUITABILITY TO TASK		
TurboTax for Windows		
	Power	Ease
Preparation	EXCELLENT	EXCELLENT
Guidance	EXCELLENT	EXCELLENT
Filing	EXCELLENT	EXCELLENT

view where you left off or jumping to the section related to the open form.

In TurboTax for Windows, Intuit has introduced a new way to move quickly to supporting forms and schedules—QuickZoom. Double-click any line in any document (or select QuickZoom from the menu) and the appropriate

SUITABILITY TO TASK		
TurboTax for DOS		
	Power	Ease
Preparation	EXCELLENT	EXCELLENT
Guidance	EXCELLENT	EXCELLENT
Filing	EXCELLENT	EXCELLENT

■ OS/2 Users Do Their Taxes, Too

By Ted Stevenson

TaxDollars, from BT&T Consumer Technology (800-672-8293), makes history as the first native OS/2 application for personal tax preparation (as far as we know). It's a bargain, too: BT&T "sells" TaxDollars for the cost of shipping—\$7.95 for the head-start or final version, \$11.95 for both.

For this modest investment, you get a basic tax preparation kit: forms and schedules, printing, some help functions, and a few ancillary aids, such as a "what if" calculator. You don't get automated or assisted data entry.

The paucity of forms is perhaps TaxDollars' most crippling limitation. We would have reviewed it alongside the DOS and Windows packages, but it lacked the forms required to run anything except our simplest test scenario. You get W-2, 1040, 1040PC, and

Schedules A, B, C, D, and E; the final version promises additional forms.

Data entry in TaxDollars is strictly manual, centered around Form 1040. Calculated fields and totals normally transposed from another form are color-coded. To enter wages and tips, for example, you can use the built-in W-2 form; TaxDollars automatically transfers the proper total or you can enter the figure directly. You navigate forms by paging (not scrolling) or, in the 1040, by using hotkeys.

An audit function alerts you to missing or incomplete data. Informative features like FAQs supplement tax and program help. LaserJet or Epson dot matrix owners can print their completed return in IRS-approved format; those with printers that don't emulate the above can manually enter appropriate setup strings. □

points out legitimate deductions that people sometimes miss.

You can file your taxes by printing out and mailing in either the condensed, IRS-approved 1040PC form or the standard forms and schedules. Though you may not want to think about taxes again for some time, TurboTax offers a 1995 tax planning option to help you prepare for next year's ordeal. An uninstall utility is also included.

Intuit has taken the complex and decidedly nonlinear process of tax preparation and made it gratifyingly clear and linear in the 1994 edition of TurboTax—particularly in the Windows version. (DOS's EasyStep is still somewhat confusing.) So the battle between the big three—Personal Tax Edge, TaxCut, and TurboTax—continues. But this year, TurboTax comes out on top. □

► **TurboTax for DOS, TurboTax for Windows.** List price: \$69.95. Intuit Inc., 2650 E. Elvira Rd., #100, Tucson, AZ 85706; 800-964-1040 ext. 6017, 602-295-3110; fax, 800-756-1040.

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User-to-User

BY NEIL J. RUBENKING

Even Faster Access to Control Panel Applets

In your User-To-User column of the November 8, 1994, you feature a tip on accessing Control Panel applets directly. Here's another suggestion: Try entering the following on the Command Line.

CONTROL MAIN.CPL DESKTOP

You will be able to launch the Desktop applet without waiting for the Control Panel to open.

*Stephen Cerruti
via ZiffNet*

► **PC MAGAZINE:** He's right—this is the fastest way yet to bring up individual Control Panel applets. To review, here's how you'd go about creating an icon for instant access to the Color applet. Open the Main group in Program Manager, hold down the Ctrl key, and drag from the Control Panel icon. You'll find you're dragging a copy of the icon. Drop it on the group window and click on it to select the copy.

Now press Alt-Enter or select Properties... from the File menu to bring up the Program Item Properties dialog. Change the Description field to Color and the Command line field to CONTROL MAIN.CPL COLOR. Press the

Change Icon button, press the Browse button in the resulting dialog, and select MAIN.CPL in your Windows system directory. Click on the three-crayons icon that represents the Color applet, press OK, press OK again. When you launch the new program item, the Color applet will come up immediately, without any wait for the rest of Control Panel to load!

A New Way to Reboot

I had often wondered whether you could reboot a PC from the DOS command line, from within a batch file, or remotely from another node. I knew there must be a BIOS routine somewhere that could han-

dle this. Using DEBUG (commonly known as "The Poor Person's Assembler"), I set about unassembling the known BIOS areas that are typically based at locations C800:0000 and FFFF:0000.

I found the BIOS reboot routine starting at FFFF:0000. This particular routine checks a two-byte value starting at location 0040:0072 (in the BIOS data area), and if this value is 1234h, a warm boot is performed. If the value stored at 0040:0072 is anything other than 1234h, a cold boot is performed.

To reboot a PC from the DOS command line using the simplest command possible (without specifying whether it will be a cold or warm boot), you need only enter

```
echo g=ffff:0000 ! debug
```

In most cases this will perform a cold boot, meaning that main memory will be checked before DOS is loaded.

If you'd rather perform a warm boot, you need to plug the value 1234 in to location 0040:0072 before the DEBUG go command is executed. You can accomplish this using a series of statements like:

```
echo e 0040:0072 34 12  
> reboot.dat  
echo g=ffff:0000 >>  
reboot.dat  
debug < reboot.dat
```

Note, by the way, that this method of rebooting is completely safe: virtually all disk-caching utilities (including MS-DOS's SMARTDRV.EXE) intercept a request for reboot so they can flush their buffers of any data that hasn't yet been written to disk. After the disk cache is "clean" (a split-second), the PC reboots.

I hope this information helps make the task of rebooting a PC more flexible!

*Sean F. Leinen
East Rutherford, New Jersey*

► IN THIS SECTION

Tutor 229
Corporate Developer 233
Toolkits 238
Environments 243
Power Programming 247
Utilities 254
Solutions 259

► **PC MAGAZINE:** This column has frequently aired DEBUG scripts that create tiny .COM files for generating a warm or cold boot. But if DEBUG scripts alarm you, this tip is perfect. A simple ECHO command redirected into DEBUG does the job. Be very careful not to omit the equal sign in the `g=FFFF:0000` command passed to DEBUG.

You might think to set the warm boot flag by redirecting another simple command to DEBUG, perhaps:

```
ECHO e 0040:0072 34 12 ! DEBUG
```

Try that and you'll lock up your system solid. Why? In almost every case, a block of commands sent to DEBUG must end with the Q for Quit command on a line by itself. Without that final Q, DEBUG won't terminate, and it won't accept input from any other source. The reboot command is an exception because when the system reboots it doesn't matter that DEBUG is "stuck."

If you have any doubts about whether your disk cache is smart enough to flush stored data to disk before a reboot, simply execute the cache's flush command beforehand. For SmartDrive, that command is `SMARTDRV /C`.

One final warning; this technique is powerful enough to restart your entire system from within a Windows DOS box. Don't do it! You'll lose any unsaved data in all open applications.

Persistent Environment Variables Revisited

I have just one question regarding the "Creating Variables That Last" (September 27, 1994): Why doesn't AUTOPARM.BAT work? I tried both versions of AUTOPARM.BAT (that is, the reader's version and PC Magazine's), and

```
@ECHO OFF
REM - This version of AUTOPARM.BAT avoids a conflict
REM with SHARE that afflicted the original.
IF (%1)==() GOTO Action
IF NOT EXIST %0 GOTO TryBat
TYPE %0 | FIND "SET %1=" /V /I > %0
IF NOT (%2)==() ECHO SET %1=%2>> %0
GOTO Action
:TryBat
IF EXIST %0.BAT GOTO AddBat
ECHO Either execute %0 from the current directory
ECHO or spell out its full pathname.
GOTO Action
:AddBat
TYPE %0.BAT | FIND "SET %1=" /V /I > %0.BAT
IF NOT (%2)==() ECHO SET %1=%2>> %0.BAT
:Action
```



Figure 1: AUTOPARM.BAT modifies itself so that it can effectively create persistent environment variables from the parameters you pass it; this version can coexist with the SHARE utility.

neither executes properly. After running AUTOPARM.BAT under either DOS 5.0 or 6.1, I end up with a blank AUTOPARM.BAT file.

When I examined the batch file, I was amazed that you could execute a batch file

and, while that batch file is executing, use it as input for a command, and then write the output back to the same file. But it is something about that process that causes the glitch. The problem seems to result from the FIND statement, which redirects the batch file currently being executed as input and as output.

My explorations did lead me to a

workaround: I found that you can achieve the desired result if the input to the two FIND statements is piped from the TYPE command instead, as in the following:

```
TYPE %0 | FIND "SET %1=" /V /I >%0
```

But I'm still curious why AUTOPARM.BAT doesn't work. Could I be doing something wrong?

Terry L. Waltz
Cumberland, Maryland

► **PC MAGAZINE:** Why would AUTOPARM.BAT work fine on one system but not on another? A little detective work turned up the offender. It's the

DOS utility SHARE, which controls what happens when two programs attempt to open the same file. At the simplest level, if a program that's unaware of file sharing attempts to open a file that's already in use by another program, SHARE denies the program access to the file. SHARE doesn't object to a batch file using itself for input, because COMMAND.COM doesn't hold the batch file open while executing it. It's the attempt to use the same file for redirected input and output that causes the snafu. SHARE refuses to permit this double access, and as a result the file gets trashed.

Just how does a batch file can get away with modifying itself? When COMMAND.COM is executing a batch file, it stores in memory the name of the batch file and the exact position in the file at which to start reading the next line. For each line, it reopens the file, seeks to the saved position, and reads the next line. As long as any changes to the batch file occur after the stored next line position, COMMAND.COM doesn't mind. On the other hand, a change that shifts text in the batch file so that the stored position no longer matches the beginning of a line will truly wreak havoc.

Indeed the solution is to TYPE the contents of the batch file and pipe its output to the input of FIND. FIND doesn't start its work until the TYPE command is entirely finished, so there's no file-sharing problem. Figure 1 is a modified version of AUTOPARM.BAT that peacefully coexists with SHARE. You can download it from PC MagNet's Utilities/Tips forum as AUTOPA.BAT. □

Tutor

BY JEFF PROSISE

3-D Graphics in Windows NT 3.5

In the computer industry, as in real life, progress tends to be made not so much in leaps and bounds, but rather in small, incremental steps. Pentium processors, graphical user interfaces, accelerated video cards, word processors that practically write your letters for you . . . you name it: Each of these builds upon foundations laid by generations of earlier technology. So when a truly innovative feature arrives on the scene, it stands out. One such feature is Microsoft Windows NT 3.5's OpenGL.

OpenGL is the powerful new 3-D graphics engine and programming interface built into Windows NT 3.5. It's an implementation of OpenGL, a platform-independent graphics standard based upon Silicon Graphics' proprietary GL graphics system. The "Open" in OpenGL means it's an open standard, overseen by an independent review board (of which Silicon Graphics is a member) and licensable by third parties. OpenGL currently runs on a variety of workstations manufactured by Digital, IBM, and Silicon Graphics, and now, with the addition of OpenGL for Windows NT to the lineup, on any computer running Windows NT. Implementations are also in the works for OS/2 and Windows 95.

What's so exciting about the Windows NT implementation of OpenGL is that workstation-class graphics have finally trickled down to the PC. Many of the PCs that run Windows, Windows NT, and OS/2 today feature modern video systems that rival expensive graphics workstations when it comes to resolution and colors. Application programs, however, are still strapped with years-old graphics programming interfaces such as Windows' GDI and OS/2's GPI. The result? Com-

pared with a typical workstation, a PC looks like a poor second cousin. And until the programming interfaces come out of the dark ages, things aren't going to get any better.

OpenGL might be just the solution. It takes much of the tedium out of creating 3-D graphics. A person writing an OpenGL program does the easy part: sets up a scene's viewing parameters, describes the objects in the scene by using OpenGL commands to create polygons representing the surfaces of those objects, and commands OpenGL to render the scene. OpenGL does the hard part. Among other things, it converts the polygonal surfaces into pixels on the screen, hides surfaces that are obscured by other surfaces, and figures in the effects of uneven lighting. OpenGL also supports double-buffered animation—long a dream of Windows and OS/2 programmers.

If OpenGL catches hold, expect to see some truly astonishing flight simulators, virtual reality engines, and other 3-D applications in the not-too-distant future. (If you've ever had the pleasure of seeing a flight simulator demonstrated on a Silicon Graphics workstation, you know exactly what I mean.) Whether OpenGL will succeed in the PC marketplace is uncertain. It requires already-overburdened Windows programmers to learn another new interface, and OpenGL apps are slow even on Pentium processors. Speed is

something a few generations of hardware and the coming proliferation of inexpensive 3-D graphics chips will probably take care of. The more fundamental question is one of endurance: Can OpenGL hang in there long enough to benefit?

PIPES AND FLYING OBJECTS A great place to start learning about OpenGL is the two OpenGL screen savers that ship with Windows NT. If you haven't seen the 3D Pipes or 3D Flying Objects screen savers already, find someone with Windows NT 3.5 installed on a PC and try them out. Play around with the various options in the screen savers' setup dialogs to see the different effects you get. Above all, be sure to try out the Explode option in 3D Flying Objects.

3D Pipes, shown in Figure 1, draws a zig-zag network of cylindrical pipes depicting what can only be described as a plumber's worst nightmare. The network is built on the screen in front of you, one pipe at a time, like a rope tying itself in a knot. Note how the use of perspective lends realism to the scene: far away objects appear smaller than objects closer to

the eye, just as they do in real life. OpenGL supports perspective and parallel projections, and it does both of them equally fast. (Perspective projection makes a scene look more realistic by rendering parallel lines so that they converge toward a vanishing point, the way your eye perceives scenes in real life.) Shading also adds a sense of depth to the

What's so exciting about the Windows NT implementation of OpenGL is that workstation-class graphics have finally trickled down to the PC.

pipes. Surfaces facing an imaginary light source are colored brightly, while surfaces facing away from the light source are rendered proportionally darker. Shading and lighting are performed automatically by OpenGL based on the characteristics you assign to each light source, the orientations of the surfaces in the scene relative to the light sources, and the surfaces' material properties.

3D Pipes is a conventional Windows screen saver in most respects. It relies on the documented mechanisms Windows

provides to all screen saver programs to know when to start, when to stop, when to display its setup dialog box, and so on. Where it differs is in how it draws. Rather than using GDI graphics functions to render objects on the screen, 3D Pipes uses OpenGL graphics functions. At startup, it sets a timer to fire every 16 milliseconds and seeds a random number generator.

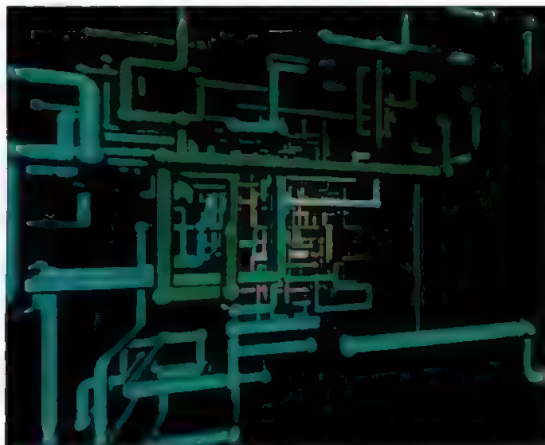


Figure 1: Windows NT 3.5's 3D Pipes screen saver shows off the rendering capabilities of Windows NT OpenGL.

Whenever the timer goes off, a timer procedure inside the screen saver uses the random number generator to pick a direction for the next segment of pipe. Then it draws a series of connected rectangles that form the outline of a cylinder. To make the pipe segment look round, OpenGL uses a form of smooth shading known as *Gouraud shading* to shade each rectangle according to the amount of light striking it, and to blend the edges where rectangles meet. In fact, that roundness is just an illusion. Every object you see in an OpenGL scene is actually composed of flat, polygonal surfaces, despite the smooth appearance.

When a new pipe is drawn behind an existing pipe, portions of it that are obscured by the foreground pipe are automatically clipped from the image. This is called *hidden surface removal*, a feature common to 3-D graphics systems. OpenGL uses a technique called *z-buffering* to determine which surfaces lie in front of others. As each polygon in the model is scan-converted into pixels (*scan conversion* takes a mathematically defined object in computer memory and calculates which pixels will represent that object on the screen), a record of each pixel's ap-

parent distance from the eye is stored in an area of memory called the *z-buffer*. When a new pixel is scan-converted, it is only transferred to the video buffer if its *z* distance—the distance from the pixel to the viewpoint—is less than any *z* distance recorded earlier for the same screen position. Thus, all the programmer has to do is specify the coordinates of the polygons' vertices. OpenGL takes care of the rest.

By default, the pipes have smooth, shiny surfaces. By clicking the Bitmap texture radio button in the screen saver's setup dialog and choosing a .BMP file, you can texture the surfaces of the pipes with a bitmap image. This demonstrates a process known as *texture mapping*. Texture mapping is a rather advanced technique that "paints" a 2-D bitmap onto a flat 3-D surface. Computer-generated surfaces often look artificial because they lack the texture and uneven coloring of

real-life surfaces. Texture mapping lends an added air of realism by allowing programs to simulate brick, wood, and other surfaces. It is often used in flight simulators and other high-tech computer graphics applications to make background objects such as terrain, runways, and buildings look real. It also slows down the rendering process. Enabling texture mapping in 3D Pipes roughly halves performance.

3D Pipes and 3D Flying Objects both illustrate how good program design can deliver decent performance, even in a system as computation-intensive as OpenGL. One way to maximize the performance of a 3-D graphics program is to keep the polygon count to a minimum. The 3D Flying Objects exploding ball looks pretty complicated, but if you look closely you'll see that it uses only a few dozen polygons. Commercial flight simulators, by contrast, often must render tens of thousands of polygons per second. The key to 3D Pipes' performance is that new pipes are simply added to the scene without disturbing the pipes that are al-

ready there. Many OpenGL applications are forced to redraw the entire scene before every screen update, resulting in dramatically lower performance.

MAZE One of the most promising uses for OpenGL is building interactive virtual environments. When rendering the objects in a scene, OpenGL figures in their positions and orientations relative to a specific viewpoint. For example, if you draw a cube with the line of sight looking directly into one of the faces, all you'll see is a square. But move your viewpoint by 45 degrees and you'll see an angled view of the cube showing two of its faces. Keep moving the viewpoint and redrawing the scene, and the cube will appear to move. That's how flight simulators and other interactive motion simulators work: by repeatedly moving the viewpoint in response to input from the user and redrawing the "world" accordingly.

To demonstrate how a virtual environment such as this works and to give you the opportunity to try it out, I wrote a small OpenGL program, called MAZE, that lets you walk through a room containing mazelike walls. You can download MAZE from Lib 3 (Tutor) of PC Magnet's Utilities/Tips Forum. Look for MAZE.ZIP; the file size is less than 18K, so downloading will cost you an exorbi-

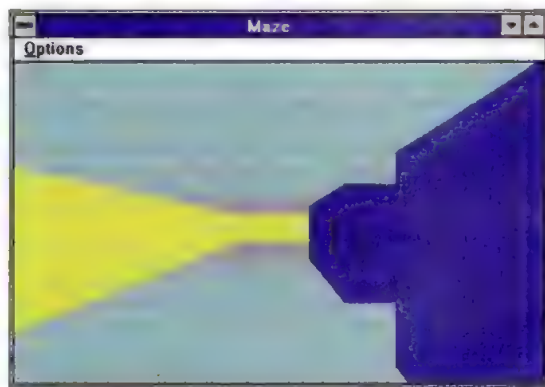


Figure 2: MAZE uses OpenGL to draw a 3-D maze, which you can navigate with the mouse or keyboard.

tant amount of time or money. Don't forget that you must be running Windows NT 3.5 on a PC with an Intel-compatible processor to run the program.

Figure 2 shows what the output from MAZE looks like as you peer down an empty corridor. You can move forward in the maze by positioning the mouse point-

er in the MAZE window and moving it toward the top of the screen while holding down the left mouse button. Moving the mouse pointer down with the button depressed moves backward. To change directions, move the mouse left or right with the left button depressed; MAZE will rotate your field of vision as you do. If you prefer the keyboard to the mouse, the up and down arrow keys also move you forward and backward, and the left and right arrow keys turn left and right.

Holding down the Ctrl key while moving with either the keyboard or mouse exaggerates your motions so you can cover ground more quickly. (A left turn without the Ctrl key, for example, rotates the viewpoint 1 degree counterclockwise. When the Ctrl key is depressed, the same action produces a 4-degree rotation.) MAZE prevents you from walking through walls, so navigating your way through its corridors is a reasonable simulation of walking through a real building. Similar, more sophisticated walk-through programs costing thousands of dollars are available for Silicon Graphics workstations.

When you tire of MAZE's default configuration, which consists simply of four corridors connected to form a square, pull down the Options menu and select Edit Maze. Up will pop the dialog box shown in Figure 3, through which you can modify the maze to create configurations of your own. To add a wall between two grid points, point to the location where the wall should appear and click the left mouse button. To remove a wall, point to it and click the left mouse button again. Do note that you can't remove the red walls that form the maze's boundary.

The red X in the lower-left corner of the grid represents your initial position in the maze. To move it, point to a new starting position and click the right mouse button. (You always start out facing "north," toward the top of the maze; you have no control over that.) Click OK to dismiss the dialog box and register your changes, and the new maze will appear on the

screen before you. Note that the outer walls of the maze are rendered in yellow, and interior walls in blue. Walls are rendered in flat, unvarying colors; I disabled shading and lighting in order to optimize performance.

As you build mazes, keep in mind that fewer walls means fewer polygons, and fewer polygons means better response time. MAZE is smart enough to combine polygons when it can, so one long wall spanning several grid points creates just one polygon, not several. The default configuration contains just eight polygons: four for the outer walls and four

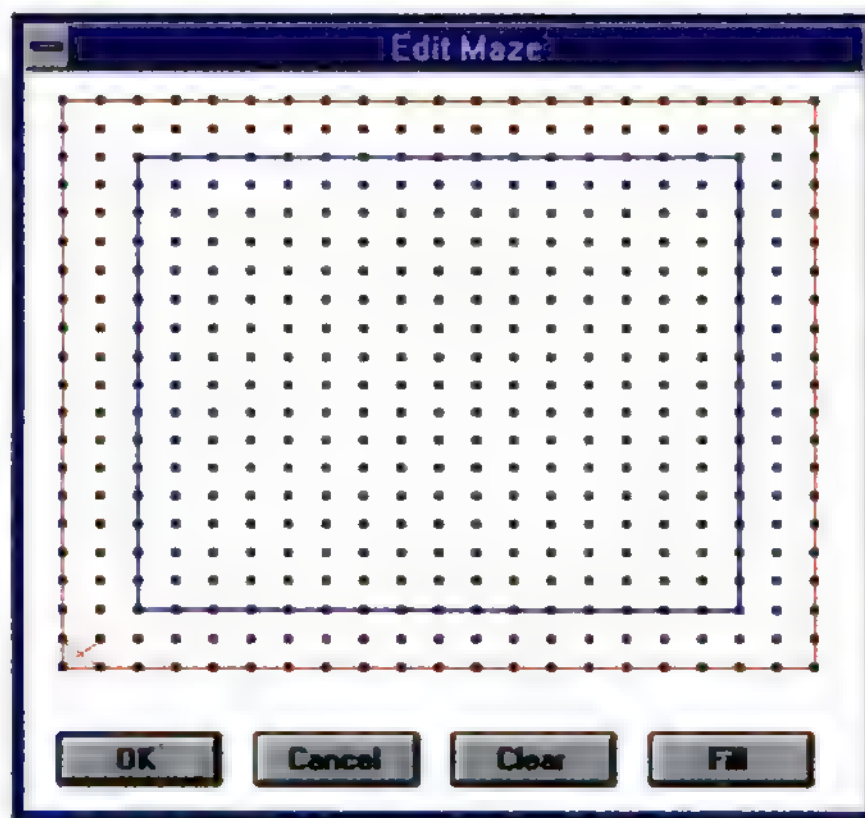


Figure 3: The Edit Maze dialog box lets you create mazes of your own. Red lines represent fixed, immovable walls forming the boundaries of the maze. Blue lines represent inner walls that can be added and removed at your discretion.

more for the inner. If you create a configuration that you'd like to keep, use the Options menu's Save Maze command to save it to disk. To reload a saved configuration, select Load Maze from the Options menu.

PERFORMANCE BOUND Unless you're using a 90-MHz Pentium with a fast video accelerator, MAZE will be pretty sluggish. The best way to improve its response time is to make the window as small as possible. A smaller window means fewer pixels to scan-convert, depth test, and transfer to the screen. If you run MAZE full screen on a 1,024-by-768 screen, you'll be lucky to get two screen updates per second. Shrink it to quarter size or smaller and it will become much more usable. Note that MAZE adapts its output to the

aspect ratio of the window that it's running in. Making the window short and wide provides a more encompassing view of your surroundings. A tall, narrow window makes it look as if you're peering through a keyhole.

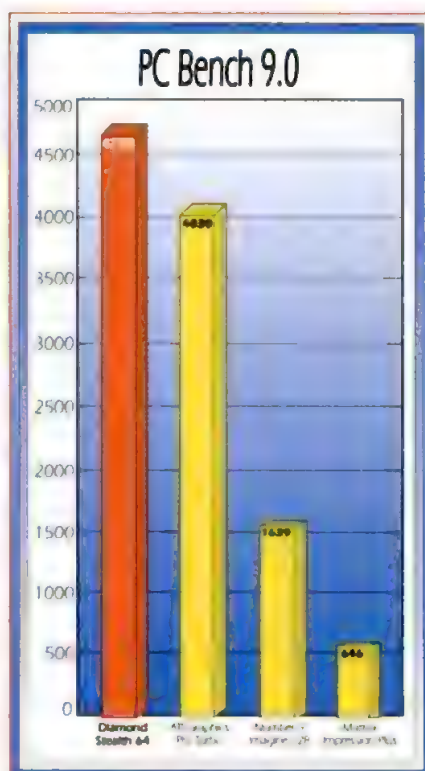
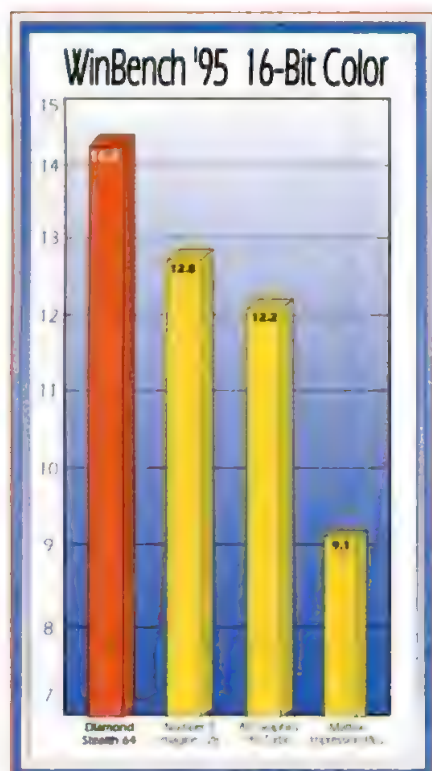
Imagine how much fun MAZE would be if a maze containing hundreds or even thousands of polygons could be rendered full screen with shaded and textured walls 20 or 30 times a second. That's the kind of performance you get when you run OpenGL on a \$50,000 graphics workstation. Graphics accelerator chips capable of rendering more than 100,000 shaded polygons per second are now available to OEMs for less than \$200. Just as conventional Windows accelerators speed Windows by handling certain oft-repeated operations such as line draws and bit-block transfers in hardware, these chips take over the workload of scan-converting, shading, and depth-testing polygons in 3-D environments, delivering orders of magnitude of performance improvement.

Microsoft anticipated the use of hardware acceleration when it designed OpenGL for Windows NT, so there's no doubt that it can be done. But can it be done inexpensively? In addition to the accelerator chip, an OpenGL accelerator needs memory, and lots of it. OpenGL uses 32-bit color, not 24. (The extra 8 bits are used to hold values specifying a pixel's opacity.) Efficient animation requires two complete video buffers, and a 32-bit z-buffer requires the equivalent of a third video buffer. Altogether, an OpenGL video card would need more than 9MB of RAM to support a resolution of 1,024-by-768, and more than 15MB to do 1,280-by-1,024. That's a lot of RAM, especially if the board manufacturer chooses to use the more expensive VRAM instead of standard DRAM. OpenGL supports other types of buffers, too, so a full-featured implementation could require twice as much RAM.

For now, OpenGL is less a practical tool than it is a glimpse of things to come. In retrospect, the same could be said of Windows 1.0 in 1985. Windows took off when hardware got fast enough to support it. The next couple of years will tell us whether the same will hold true for OpenGL. □

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Windows 3.1 PCI performance tests performed by Diamond Multimedia Systems, Inc. on publicly available hardware and software running ZiFF-Dave's WinBench'95 Version 1.0 on an HP Vectra XU 5/90 Pentium 90MHz system with 256k cache, 40MB RAM, 540MB SCSI hard disk, SmartDrive 2048 128, and DOS 6.2. All Cards were tested at 1024x768x65k 72Hz Large Font. The Stealth 64 VRAM was configured with 2MB of VRAM using driver release v1.20. The ATI Graphics Pro Turbo was configured with 2MB VRAM using driver release v1.03. The #9 Impression 128 card was configured with 4MB VRAM using driver release v1.29. The Matrox Impression Plus was configured with 2MB VRAM using driver release 1.42.

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December, 1994

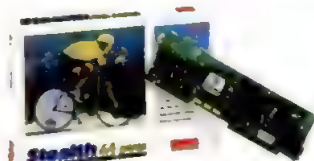


November, 1994



September, 1994

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Corporate Developer

BY BARRY SIMON

Taking Windows Help to the Limit

Whether for an on-line employee manual, a customer query database, or a list of human resources, nothing is as good as hypertext when it comes to making large text bases accessible. The hypertext tool of choice for many authors and developers is the user-familiar Windows 3.1 help engine, WINHELP.EXE. The tools that Microsoft provides to assist you in creating help files may be less than ideal, but the engine itself is superb.

Three limitations of Windows help may cramp your style, however. First, while it allows embedded 16-color bitmaps, WinHelp provides no native support for multimedia files or for 256-color bitmaps. Second, WinHelp offers no full-text search facilities. And third, you can't build your own interface from the ground up.

In this and the next Corporate Developer column, we'll examine three Microsoft attempts to overcome these shortcomings. Each of these attempts addresses the first two limitations, and each imposes only minor changes on help source files. Multimedia Viewer 2.0 has been around for some time; MediaView was released in October, 1994; and Windows 95 help is under construction. In this first installment, I'll discuss these three help extensions and their interrelations. Next time, I'll focus on the production of source code for these engines and discuss the tools available to authors of help and extended help applications.

HELP REDUX The separate topics into which help files are divided contain four basic elements:

Jump words. These appear in green with solid underlines and, when clicked,

take you to another topic.

Pop-ups. These appear in green with a dotted underline and, when clicked, produce a borderless window that pops up over help and disappears on the next click.

Contents page. The opening page of the help file, also accessible via the Contents button, this lists some or all of the topics and sets them as jump words.

Keyword index. Accessible via the Search button, this lets you jump to topics based on keywords assigned to them.

Help is prepared in source files, which are then run through the DOS-based Microsoft Help Compiler. Licenses for the Help Compiler are included with many languages, help authoring tools, and even with such applications as Access.

Help source code breaks down into three parts: a project file, which sends commands to the compiler; topic files; and graphics that are called from the topic file(s). The topic files must be in *rich text format* (RTF), which is an ASCII format with embedded formatting commands, for example "[footnote]". Microsoft tells you to use Word for Windows to prepare the RTF files, since Word lets you save your files in this format. But you could just as easily use another word processor, for example Ami Pro, that can also save in RTF. Similarly, while you'd be crazy not to let a word processor handle such bookkeeping details as setting up font tables, you can use another third-party

WYSIWYG help editor, whether a stand-alone, such as ForeHelp, or one that works with Word, such as RoboHelp. The points to remember are that RTF is an ASCII format, and that it may sometimes be useful to look at and even modify the topic files in an ASCII editor.

Be warned, however, that RTF is interpreted differently by different word processors, so that a file saved in RTF format from one may not be readable in another—or even by the Help Compiler! Specifically, older versions of the Help Compiler don't understand RTF files created under Winword 6.0, so you want to be sure you have the latest version of the Help Compiler (see the Microsoft Developer's Network CD-ROM or the Microsoft CompuServe forums).

HELP MACROS Most of the advanced help features depend on macros. The official documentation (one chapter in each of two of the Windows SDK manuals, *Programming Tools* and *Programmer's Reference*, Volume 4) lists more than 60. Macros can be executed in three separate ways. First, by placing macros in an ap-

propriate section of the project file, you can have them executed when the help file loads. This is where you'd put macros that add buttons to help's (text-only) button bar or that add an extra user menu. It is also where you declare your own macros, as I'll discuss shortly. Second, you can associate a macro to a

*Here we examine
Microsoft's three attempts
to improve Windows help:
Multimedia Viewer,
MediaView, and
Windows 95's help system.*

topic and have it executed each time the topic is entered. Third, you can associate a macro to a hot spot and have it run when the user clicks on the hot spot. Jump words are in reality textual hot spots where the click is associated to a jump, but an author can instead have the textual hot spot run a macro. Embedded bitmaps can also be hot spots.

SEGMENTED HYPERGRAPHICS Help supports a unique bitmap file format whose .SHG extension stands for "Segmented HyperGraphic". This is typically created using the SHED.EXE program that ships with most sources of the Help

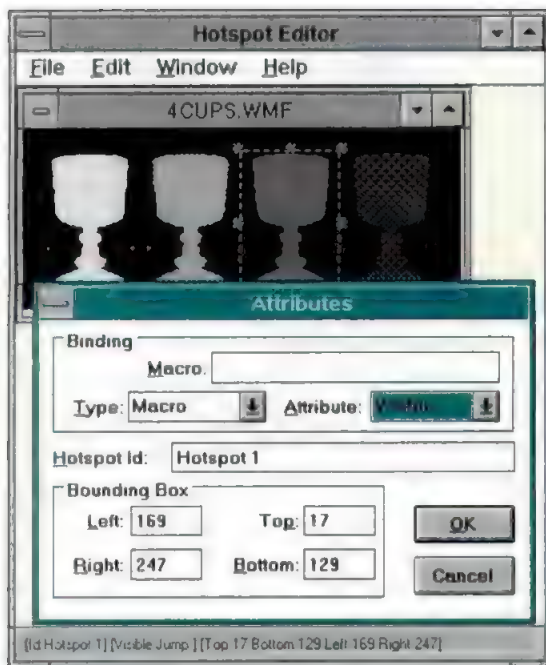


Figure 1: SHED.EXE is used to create segmented hypergraphics, which carry an .SHG extension.

Compiler and can be downloaded from CompuServe's WINSDK forum. These .SHG files may have several distinct rectangular hot regions, which can generate distinct jumps, pop-ups, or macros. You import a bitmap into SHED, draw rectangles, and indicate the action to be performed upon double-clicking from a dialog box. This is illustrated in Figure 1.

OTHER ADVANCED FEATURES Here are some other features that can be put into a help file:

Browse sequences. By placing the proper macro in the project file, you can add buttons labelled >> and << in the button bar and have them move through a specified topic order.

Secondary windows. You can have a macro pop up information in a secondary window that floats above the main help window. To see an example, just run Program Manager's help and hit the Glossary button. You can have up to six distinct types of secondary window, although only one of them can be displayed at a given time.

Nonscrolling regions. You can arrange for the first few lines of a help topic to stay in view while the rest of the topic scrolls underneath it.

Aliases. You can define equivalent keywords. To use the standard example,

"July 4, 1776" is an alias for "7/4/1776".

Jump words. You can arrange these to jump to the middle of a specified topic.

DLL calls. Placing the RegisterRoutine macro in the project file lets you call any DLL, so that in essence you get to call help extensions with your own macros.

This extensibility of the help engine can overcome some of the limitations of Windows 3.1 help. For example, by making calls to MMSYSTEM.DLL, you can add sounds to a help file. Moreover, using RegisterRoutine, third parties have added such refinements as support for 256-color bitmaps.

GOTCHAS AND WORKAROUNDS Windows 3.1's help has some infamous gotchas, a number of which are actually products of the Winword/WinHelp combination most often used to author help.

Windows 3.1 help supports any ANSI TrueType font on the end user's system. But Windings, for example, aren't ANSI. (Symbol isn't ANSI either, but the Help Compiler has special built-in support for the Symbol font.) The simplest workaround is to use screen capture to make Windings into graphics and to place those in your file instead. Topics in an RTF file, including any embedded graphic data, are limited to 64K each, but you can always use the RTF sequences that help supports to place graphics by external reference.

WinWord does not properly write table borders or bulleted lists when you save in the RTF format required by the Help Compiler. The slickest workaround for tables is to create them in Excel and copy them to the clipboard as pictures and embed them in help as graphics. Similarly, the Help Compiler doesn't support superscripts or subscripts, but again the workaround is the

clever use of bitmaps.

PUSHING HELP TO THE LIMIT Examining the help applets of The Norton Desktop for Windows will show you some of the tricks you can use to push the help format to its limit. Desktop's content page appears as an outline which can be expanded by clicking. The expanded view is shown in Figure 2. The expand button and the folder are actually hot spots that jump to an entirely new topic containing the expanded table of contents.

Similarly, if you click on the "See Also" shown in Figure 3, you'll get a pop-up with jump topics. Most help files use pop-ups only for glossary-style definitions, but Desktop makes creative use of the fact that pop-up windows display topics that can have hot spots, call macros, or contain jump words. The help also makes clever use of secondary windows; for example, the "QuickHelp" shown in Figure 4 is a secondary window that displays a single segmented hypergraphic.

MICROSOFT MULTIMEDIA VIEWER 2.0 Multimedia Viewer goes beyond Windows 3.1 help in its support of multimedia and its

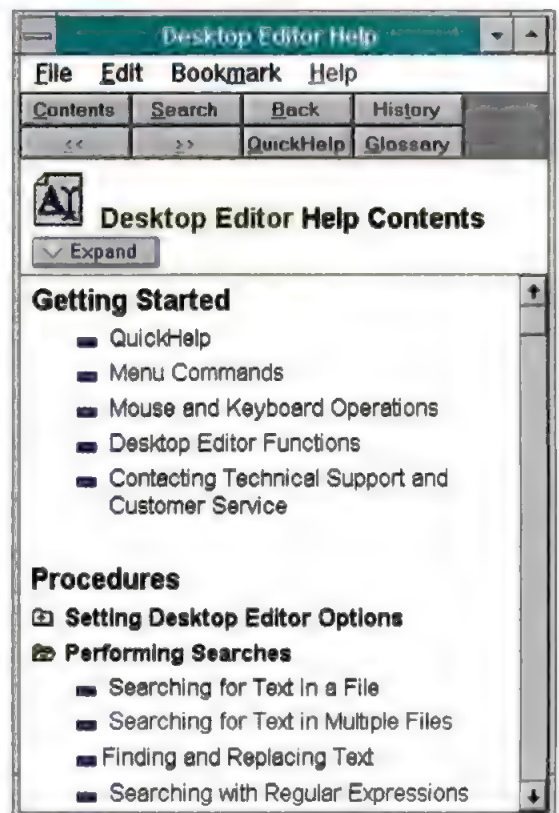


Figure 2: This expanded view of the Norton Desktop illustrates the use of hot spots that jump to what is actually a second table of contents.

full-text indexing. It is almost completely upward compatible with help source code in that, unless you use a very limited number of obscure macros or RTF strings,

source files for WinHelp should compile for Viewer with only minor changes in the project files. The most significant difference is a changed way of setting up aliases.



Figure 3: Topics displayed in pop-up windows can themselves have hot spots that call macros or contain jump words.

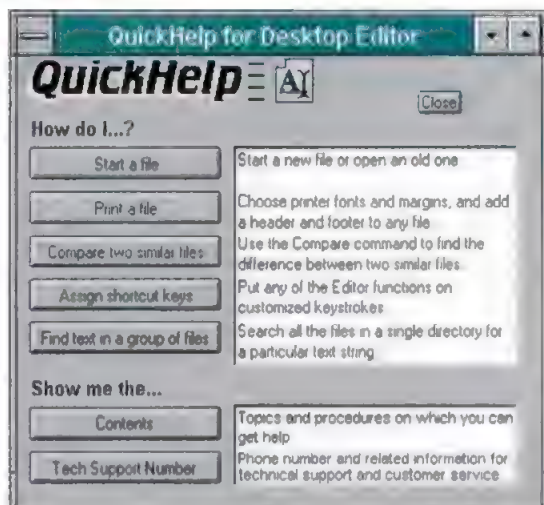


Figure 4: This QuickHelp window shows an example of a segmented hypergraphic.

The Viewer compiler automatically creates an index for full-text search. Thanks to the full index, searches are rapid; but because you can choose to compress the index, the overhead is not large. As shown in Figure 5, the search dialog is accessible from the default button bar and via macros, and it allows both Boolean searches and searches that require the presence of nearby words.

The result of a search is a scrolling list of matching Topics, shown in Figure 6. The hit list can be kept displayed in order to view several matches successively. An author can also customize the search to include categories and keywords by category.

Viewer allows you to break the main window into separate subwindows, called panes, in which multimedia viewers are often embedded. The pop-up concept has been extended to allow multiple levels of pop-ups in Viewer applications.

VIEWER'S MULTIMEDIA CAPABILITY When Viewer plays multimedia files, it uses Windows' MCI (Media Command Interface) as its core technology. This interface includes a near-English message set that includes both device-independent commands such as Stop or Pause, and others, such as Eject, that are device specific.

If you wish, you can send MCI commands directly with Viewer macros, but the easiest and most frequently used approach is to insert a controller—a button bar with slider that automatically handles details like opening and closing devices.

While the controller is embedded with an RTF sequence, the authoring tools that come with Viewer also make it easy to customize the controller from dialog boxes.

The default "standard controller" shown in Figure 7 has a slider and stop and play/pause buttons, but you can include any or all of the buttons shown in the lower section of the figure: eject, scan back, section back, section forward, scan forward, stop, pause and play. You can even define sections of the media and have the controller include a pop-down list of sections from which the user can choose.

Viewer has built-in support for CD audio, .WAV, MIDI and .AVI files. One advantage of using MCI for the interface is that if a vendor of another multimedia type provides an MCI interface, you can

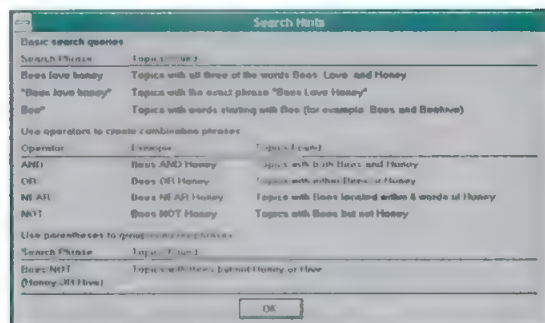


Figure 5: The Multimedia Viewer supports both Boolean and phrase-based searches.

easily call that type from Viewer. You'll find MCI drivers for Autodesk Animator in the self-extracting archive WINPLA.EXE on Autodesk's CompuServe forum, for example.

SUMMING UP VIEWER Once available as a retail package called the Multimedia Viewer Toolkit, Viewer is no longer sold separately. It is, however, included on MSDN Level 2 CDs. (The Microsoft Developer Network comes out quarterly. Level 1, normally a single CD, costs \$195 annually; Level 2 with multiple CDs costs \$395 annually.) Viewer comes with authoring tools and the compiler. Before you decide to use Viewer, you'll want consider that most of its capabilities will be built into Windows 95 Help. Why would you want to get Viewer knowing this? For one thing, you might want to use multiple panes, and this won't be supported by Windows 95 Help. On the other hand, if you have a Windows 3.1 help application already and its users have simply been asking for full-

text search, getting Viewer is almost a no-brainer, as you'll shortly be able to add indexed searching with virtually no effort.

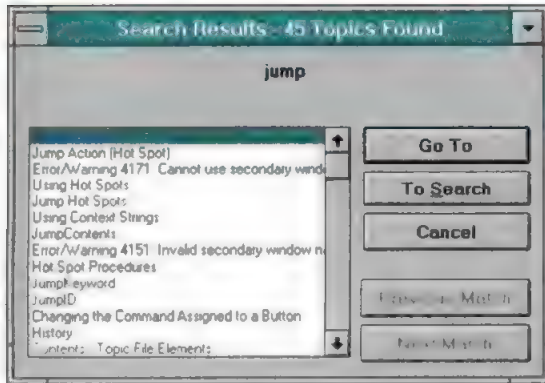


Figure 6: Using Media Viewer, the list of matching topics can be kept on-screen for successive searches.

MEDIAVIEW Viewer proponents often point out that some of the elegant consumer multimedia titles from Microsoft—such as Bookshelf, Encarta, Cinemania and Complete Baseball—were developed using Viewer. That's the truth, but not the

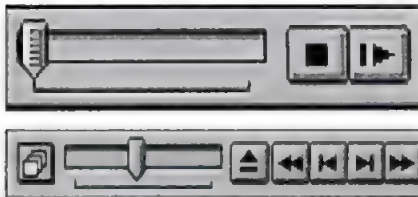


Figure 7: Viewer's simple standard controller (top) can easily be expanded to include the wider range of buttons you'd find on a cassette or CD player.

whole truth. The current versions of these CDs are not Viewer applications made by compiling a project file. Rather, they utilize some of the DLLs (or improved in-house versions of them) that shipped with Viewer to provide full text search, control of jump words, and similar services. Their UI is in fact a custom interface written in C.

Sophisticated Viewer developers requested the same capability from Microsoft, which responded rather generously. MediaView, which provides that capability, shipped in beta form on the July Level 2 MSDN CDs and should now be available in final form. Moreover, it is part of the free (subject to a company decision on possible shipping and handling charges) Multimedia Developer's Jump Start CD. This last can be requested by

sending e-mail to mmdinfo@microsoft.com or by sending a fax to MM Developer Relations at 206-936-7329.

MediaView includes DLLs and a compiler to turn RTF files written for WinHelp into files that the DLLs can use. But the title developer is responsible for the interface and for handling the messages the DLLs send when a hyperlink is clicked or when the cursor moves over a hot spot.

C headers and a VBX (the Visual Basic custom control format) are included to facilitate writing MediaView applications in C or Visual BASIC, and source code for several samples is provided. But don't let the existence of a VBX make you think that most of the programming has been done for you in the VB version. The DLL calls are indeed declared in a .BAS file. However, you'll need to write code for virtually everything that the MediaView application does beyond displaying topic panes, responding to search queries, and sending messages when hot links are clicked. While a Windows 3.1 WinHelp or Viewer application can be written by non-programmers, MediaView applications will require real programming.

IN THE NEAR FUTURE Windows 95 help was still under development when this was written. While some of its features and many elements of its long-term strategy are clear, there are still some questions about what will make it into the initial release. Help is to have a new look and feel. There will be local menus that are activated by the right mouse button, for example. Figure 8 is a screen shot from the first Chicago beta. The menu was not yet in and the button bar status wasn't clear, but the figure shows the tabbed user interface that will mark the new help program. As seen in Figure 9, the Contents Tab will support true multilevel outlines. The Index Tab will replace the

old search dialog and become the new container for keyword links. There will also be a Find Tab that supports full-text searches.

OLE IN WINDOWS 95 HELP Windows 3.1 help allows users to copy part of the help file to an application, but the procedure is awkward. Choosing Edit/Copy from the menus places the current topic in a new window. Once there, the user needs to select the text, copy it to the clipboard, and then paste into the target. By contrast, assuming that the target supports OLE drag and drop, Windows 95 help will let you select the text directly in help and simply drag it to the target.

Obviously, it would be wonderful if full OLE client support in help were provided. In such a case you could, for example, embed a live piece of your application or of one that all your users have. It is unclear, however, whether this will make the first cut of Windows 95 help. It would be ironic if third parties were required to supply full OLE support in displaying the Windows 95 logo, but so far such support isn't there.

One link to applications that has been promised in Microsoft's documentation is "Training Cards." This is a help mode that will allow applications to communicate with help to set up very clever tutorials. Other Windows 95 help features will include the following:

Full MCI support. Indeed, Windows 95 is expected to support almost all fea-

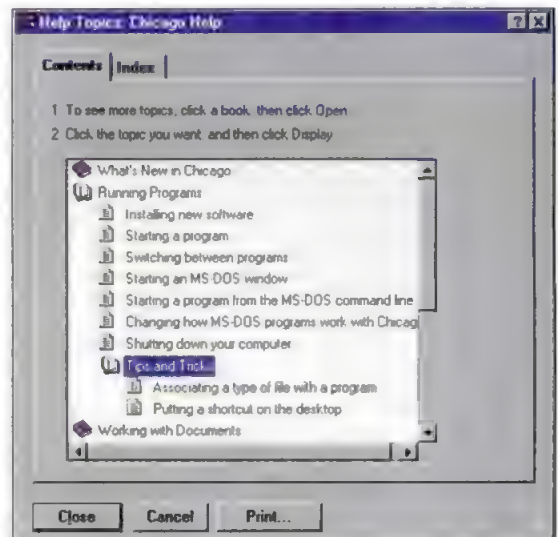


Figure 8: Windows 95 help will incorporate tabbed submenus.

tures currently found in Multimedia Viewer.

Macro buttons. A simple RTF-type string will let authors put buttons that run macros anywhere where text can be placed.

Multiple on-screen secondary windows. This may be a mixed blessing, since users may become confused if too many free-floating windows appear at once.

Enhanced secondary windows. These will include button bars and menus.

Enhanced graphics capability. Windows 95 will support for 256-color and 24-bit bitmaps.

Font improvements. Support for WingDings tops a list that includes support for non-ANSI character sets and that will enable users to increase or decrease font sizes by 2 points.

Author mode for help. A switch on the Help Compiler will let the author produce a special version of help for debugging purposes.

COMPATIBILITY AND THE FUTURE Right now, there are three Microsoft hypertext tools to consider. There will be

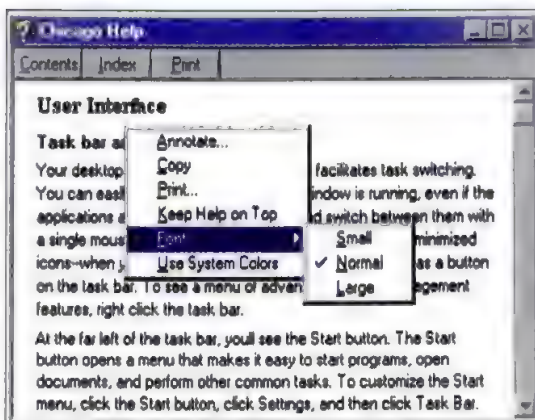


Figure 9: The new help will also make use of floating panes.

only two when Windows 95 ships, assuming that all your users upgrade, since it should be easy to convert Windows 3.1 help and Viewer source code to the Windows 95 help format. The one big Viewer feature not expected to make the first version of Windows 95 help is multiple panes.

For the moment, then, developers who want a totally customizable interface will need to use MediaView even after Windows 95 ships. But Microsoft has indicat-

ed its intention to open up the help libraries in a way that will eventually merge MediaView capability into the help system.

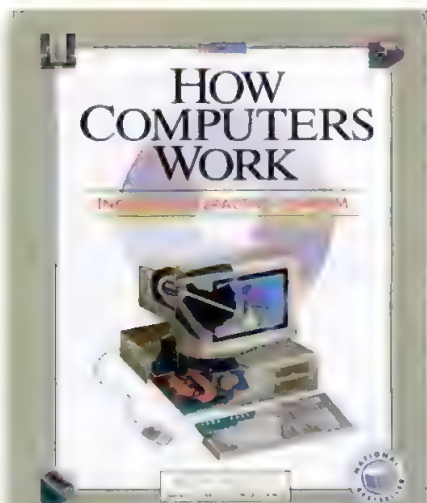
As we migrate to this brave new world, one major compatibility question remains unanswered: Will it be possible to run Windows 95 help files under Windows 3.1? As of this writing, at least, Microsoft expects to be able to provide a new version of the Win32s libraries that will allow the Windows 95 help files to run under Windows 3.1.

So far, I've shown you the power of the existing WinHelp Engine and the extra features available in the various Microsoft extensions, including Windows 95 help. In the second half of this story, I'll discuss some of the nitty-gritty involved in producing help source code and the tools available to make the process easier. □

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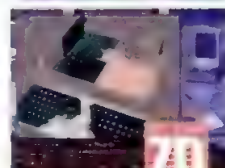
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WHIZ



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Toolkits

BY NEIL J. RUBENKING

Essential Tools for Visual Basic

Microsoft Visual Basic is deservedly famous for its ease of use, but it's not perfect. ToolThings, Version 1.0 (\$179), from Pinnacle Publishing, supplies the tools that Microsoft forgot. Clearly designed by VB developers for VB developers, it's a collection of ten tools to help with designing forms and managing code. The tools are accessed via a floating toolbar with buttons to launch each *Thing*.

DESIGNING FORMS Form Thing speeds form creation by controlling all the important form properties. It lets you display forms in test mode, save reusable form templates, and save the completed form into the current project.

VB's common dialog control has dozens of confusing properties drawn from all the common dialog types. CMDi-
alog Thing builds code for setting properties and lets you preview the result and save templates for reuse. Especially noteworthy is its ability to build a file-dialog filter string from a list of common file types.

Nudge Thing fine-tunes the size and alignment of VB controls and can work on groups of controls. Each click on one of the eight directional arrows either moves or stretches selected controls in that direction. You can undo any action, and you can lock controls in place so they don't get moved accidentally.

The default tab order for VB controls is the order in which you created them, and changing the order is tedious. Tab Thing displays a form's controls in a list, and you change the order simply by moving them. Tab Thing adjusts the TabIndex for each.

To create a message box with MsgBox Thing, you simply fill in the message and

title and check off the desired icon and buttons. Click on Test for a preview, and then paste the MsgBox function call into your code. You can save frequently used message boxes as templates.

MANAGING CODE VB's editor keeps your spacing and capitalization consistent. Dent Thing goes a step further by adjusting the indentation of blocks of code in a procedure, file, or project. You can control the indent level (in tabs or spaces) for each of eight program elements.

In VB, commenting out a block of code for debugging is slow and laborious. Blockout Thing makes it easy, and you can add markers to distinguish the blocked-out code from real comments. Blockout Thing also lets you generate boilerplate comments with the date, time, project name, and so on.

Compress Thing locates and removes unused code and data from a project to reduce the size of your executable. It can also remove comments, blank lines, indentation, and debugging statements. It can also be used to add line numbers to code. The

result is stored in a separate directory so none of your original code is lost.

Type Thing scans program files for user-defined types, constants, and global variables, and then saves all these in a file for reuse. It can generate several types of assignment statements, along with code for type, global, and constant declarations. Use Type Thing with CONSTANTS.TXT to extract only the items your program needs.

Call Thing scans program files for user-defined functions, subroutines, and DLL function calls, and it stores the definitions in a library for reuse. Scan the VB-supplied WIN30API.TXT and WIN31EXT.TXT and you can instantly insert a call to any Windows function. Type the beginning of a function name in VB and press Alt-C to fill in the rest.

Code.Browse, which scans files for reusable code, is a ToolThings bonus—the eleventh of the ten tools. It's good to reuse code, but if you can't find the code, you can't reuse it.

This initial release of ToolThings has a few minor bugs. The Form Thing fails to set the ControlBox property to True, for example, and the Call Thing's Auto-Find doesn't work for declarations. But these quirks will soon be fixed. ToolThings is an invaluable aid to VB programmers.

► **ToolThings, Version 1.0.** List price: \$179. Requires: 286 CPU or better, up to 3.5MB hard disk space, Microsoft Windows, Version 3.1, or later, Microsoft Visual Basic, Version 3.0. Pinnacle Publishing Inc., 18000 72nd Ave. S. #217, Kent, WA 98032; 800-231-1293, 206-251-1900; fax, 206-251-5057.

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OFF THE STACK

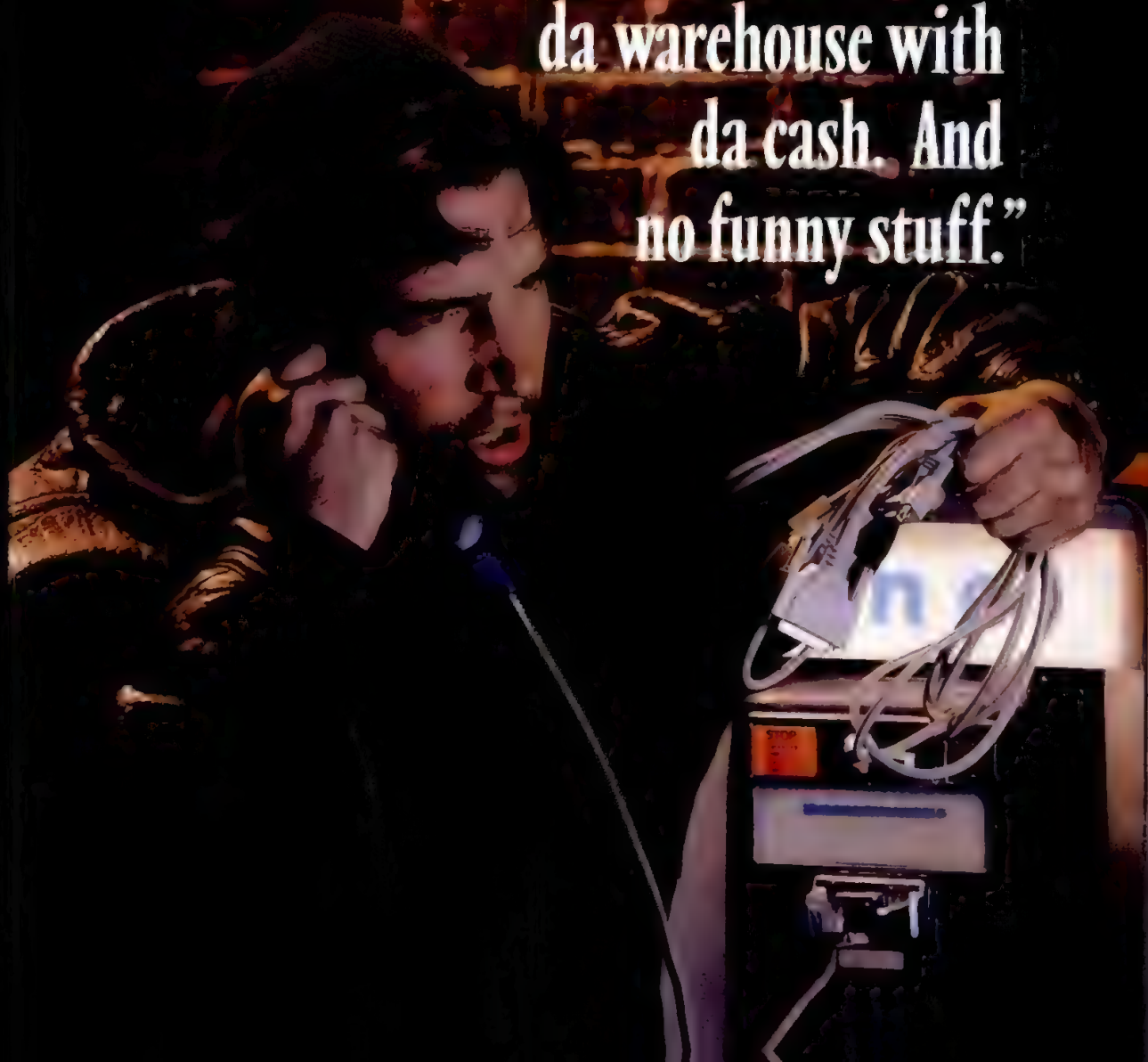
● **Premia Corporation** is offering a version of their powerful programmer's editor for Microsoft Visual C++. Called Codewrite Fusion (\$149), the editor integrates seamlessly into the Visual C++ Workbench. Features include a version-control interface; side-by-side file differencing; DLL extensibility; language templates; and CUA, Brief, vi, and other command sets. *Premia Corporation*; 503-641-6000; fax, 503-641-6001.

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Environments

BY CHARLES PETZOLD

Windows 95 and The Evolving User Interface

Remember the term "user-friendly"? It enjoyed a brief vogue some years ago when vendors finally figured out that personal computers should be accessible to normal people.

In the early days of personal computing, programmers wrote programs that were used mostly by other programmers. The relative scarcity of applications allowed these sophisticated users to spend an inordinate amount of time learning the intricacies of the one or two particular programs they needed (WordStar and VisiCalc, for example). The proliferation of applications and the expanding user base required some changes to this arrangement, and "user friendly" became a prevalent buzzphrase. The idea was that applications should be designed for the convenience of the user rather than the programmer.

Nowadays, of course, no software vendor would claim that their products are user-friendly. It's like saying a new automobile comes with a steering wheel, gas pedal, and radio. It's a good trend. My basic rule—particularly for CD-ROM products—is that the quality of the software is inversely proportional to the length of the documentation required to use it. Perfect software documentation tells you whether to run D:\SETUP or D:\INSTALL, and everything else is obvious. (The exception, of course, is compilers; making personal computing easier for users often means making the programmer's job harder.)

Although user friendliness is a given

these days, what's equally obvious is that true user friendliness is an elusive goal. One recalls Steve Jobs's infamous prediction on the eve of the introduction of the Macintosh that computer magazines were doomed to oblivion. He said that Apple was about to introduce a computer that was as easy to use as a washing machine, and that nobody buys washing machine

and dialog boxes in many Windows programs look and act pretty much the same, and I'm happy that virtually every Windows program that works with files has an Open command in the File menu that can be invoked from the keyboard using Alt-F-O. With the use of the common dialog box library, even the File Open dialog looks and acts very similar in very different applications. Certainly this is a good thing.

I'm not sure whether I've ever said this in print, but for many years I've been telling my computer-industry friends and colleagues that even a bad interface is good—so long as it's consistent among applications. I don't care what I have to do to invoke a File Open dialog box, or to navigate among the fields of the dialog, as long as once I learn how to do it, I don't ever have to learn something else.

In the early days of Windows, some programmers and designers were afraid that a standardized user interface would lead to a bland uniformity among Windows applications. But this hasn't happened. Windows applications have continued to be much more exciting than

anything we ever encountered in the anything-goes world of DOS. And, yeah, the detractors will say, Mussolini really did make the trains run on time. I've heard programmers make the correlation between rigid operating environments and fascist dictatorships too many times to let their complaints go unanswered.

Let's put things in perspective: While most of us enjoy the freedoms we have in our personal and political lives, the creation of technological (and even subtechnological) prod-

ucts is a different matter. We have standards for electrical current, battery sizes, light bulbs, telephones, fitted bedsheets, paper, audio and video recording and playback formats, and much else. If you were a manufacturer of toilet paper, would you create a roll that deviated from the approximately 4½-inch standard? Good luck if you do!

Standards are truly benevolent dictatorships. They liberate rather than enslave. Standards provide us with no-brainer decisions in the development process.

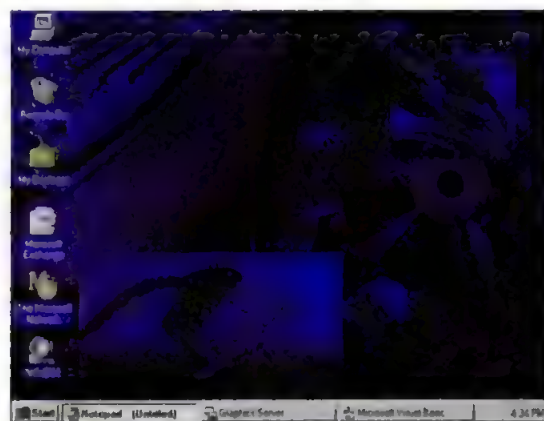


Figure 1: Windows 95 will sport a toolbar across the bottom of the screen.

magazines. Though his prediction was thankfully off the mark, the Macintosh did set high standards in the realm of user interfaces that Microsoft (with Windows) and IBM (with the OS/2 Presentation Manager) are still trying to meet. The problem is that nobody really knows what an optimal user interface looks and feels like, or even if there is such a thing.

CONSISTENCY AND NOGOBLINS Ever since the beginnings of Windows, a major selling point for me has been the trend towards a consistent user interface. Menus

WHO ELECTED MICROSOFT? We are entering a period in personal computing where standards in applications must guide our programming design decisions to the same extent that standards guide the manufacturers of other products. In this sense, software is not all that different from hardware. Applications can't stand alone. They must work in conjunction with an operating system—and work harmoniously. What bothers people, though, is that one company is dominating the setting of standards in Windows programming, and that company, of course, is Microsoft. Because it's so large and so powerful, Microsoft is a prime candidate for bashing. We've all done it and we've all enjoyed it. Playing David against Goliath is probably an innate trait of the human species.

In truth, the setting of standards is a thankless job. Nobody likes the results: "It goes too far." "It doesn't go far enough." "It's too rigid." "It's not precise." And so forth. But somebody has to do it. And, in a sense, we've elected Microsoft to set these standards by buying their operating system products and by not trying to develop standards.

A STRONGER FOCUS With Windows 95, the user interface is entering the next stage of its evolution. In the last issue I gave thanks that Windows 95 would provide programmers with a mainstream 32-bit environment (although Windows 95 has much less "32-bitness" than might first seem apparent), but the major impact may really lie in the user interface guidelines that Microsoft is now promoting.

The Windows 95 "User Interface Design Guide" (which so far I've seen only in draft form) is longer and more precise than its predecessors. Many of the concepts have been brewing for a while—since the introduction of Windows 3.0 and even before—but here we get them all in one place and in no uncertain terms.

Toolbars are one example. Although we've seen toolbars adorn the top or sides of application windows for some time, they've become more prominent now that Windows 95 itself has a toolbar at the bottom of the screen (Figure 1). The Windows 95 toolbar displays icons and text descriptions of running applications; application toolbars usually display iconic representations of operations that can be performed

on data. As we'll see, Microsoft is trying to merge these two concepts.

A good help system is considered essential these days, and other aspects of the user interface (drag-and-drop, contextual pop-up menus, new controls) are also discussed in the new user interface guidelines.

In theory, these guidelines make a lot of sense, and in the months ahead I'll be using this column to explore different ways they can be implemented. In other words, I'll be going along with the flow. But before I begin, I feel obligated to register a few dissensions.

THE PROBLEM WITH METAPHORS

Metaphor: It means that one thing represents another. Early on, creators of various operating environments prided themselves on using a "desktop metaphor."

The concept is still very much alive; Windows 95 even introduces the infamous trash can to the screen. The problem is, once we think of the personal computer as a metaphor for something else, we are inherently limiting what we can do with it. The PC is different from a physical desktop, much different. Of course, the people who promote metaphorical interfaces sometimes warn about falling into this trap, but it still remains a trap.

The desktop metaphor is appealing because it makes the PC appear to mimic the pre-PC working environment. There's the clock, a calculator, a cardfile, a file cabinet, and the trash can. The trash can illustrates one problem with metaphors. Every programmer knows what happens when a file is deleted. DOS frees up the space in the file allocation table and the directory entry. Eventually the space is reused by other files. Only clever utilities can undelete a file, and even then it's not foolproof.

But what happens when a file is moved to the trash can? After all, papers thrown in a real trash are easily recoverable—at least until the end of the working day. As

a programmer, I naturally assumed the trash can simply performs a deletion operation. The first time I used a trash can icon, I couldn't understand why I wasn't freeing up space on my hard disk. Then I discovered I had to empty the trash can.

The folder is another metaphor. I suppose nonprogrammers understand the concept of folders quickly, but I wanted to know what a folder really was, and I breathed easier when I discovered that it's usually a subdirectory.

We as programmers have a special challenge. To design software properly, we must wipe away all the technical knowledge from our minds and pretend we are naive users.

DOCUMENT CENTRISM One of the primary goals in the new user interface guidelines for Windows 95 is to move to-

wards a document-centric environment. That is, users should be focused on creating and editing documents; the various applications available are merely tools to assist in parts of this document.

Microsoft has been promoting the concept of document centrism for a while, but with Windows 95, the powers that be seem to be emphasizing it more

than ever. Yes, document centrism makes a lot of sense. But in the real world (in as much as personal computing is a real world) the implications are staggering.

For the programmer, the challenge of application interoperability now goes far beyond the basics of the clipboard and the messiness of dynamic data exchange (DDE) into the terrifying realm of object linking and embedding (OLE). OLE is possibly the most complex operating subsystem ever devised. Even nailing down the basic concepts involves immersing yourself in extreme object-oriented jargon that befuddles rather than illuminates. I recently attended a Windows programming conference where the attendees exiting from a full-day seminar on OLE wore that glazed look one normally associates with close-call survivors

Microsoft has been promoting the concept of document centrism for a while, but with Windows 95, the powers that be are emphasizing it more than ever.

of natural disasters. Programmers who know the hassles involved in programming for OLE will tell you that only an idiot would use the raw interfaces. Get at OLE from Visual Basic or the Microsoft Foundation Classes, they will say.

However it's done, we're all going to have to do some OLE coding. Don't be afraid to yell and scream during this process. It's a natural reaction to torture.

WHAT IS A DOCUMENT? The document is also a metaphor, and that's why the classic example of "OLE at work" involves an office memorandum. This memo contains text, of course, but also chunks of a spreadsheet, database listings, business graphs, voice annotations, perhaps a little music (in a major key for positive net earnings, a minor key otherwise), and a bitmapped photo where the author's signature would normally appear. Although all these different types of data are incorporated into one document, they are managed by different specialized applications. So far, so good. I like the idea of seamless integration of disparate data types in a single document.

The problem arises when we recognize the crudeness of the document metaphor. We're still entangled in the idea of hard copy—something that eventually pops out of our printers. This was fine in the early days of computing, because we used the PC to automate activities we'd be performing less efficiently otherwise. For example, a database program manages index cards; a word processing program is a typewriter with a really great Wite-Out facility; a spreadsheet program is . . . well, what used to be called a worksheet back in the days when I did actuarial calculations with a pencil and calculator. The value of these programs was obvious to those of us who grew up with the unautomated tools that they replaced.

As personal computing has begun to move beyond these imitations of office tools, the concept of the document has become much less relevant. This is very obvious when we begin looking at the increasingly wide array of multimedia programs. In one sense, these programs use documents comprising various data types, but most of them don't exist to create documents.

Computing is all about information—the creation, editing, manipulation, stor-

age, retrieval, and rendering of information. Fewer people create information than need to use the information, just as fewer people work at fast food restaurants than eat there.

Of what use is OLE to my favorite Microsoft application, Cinemania? Actually, if you ask this question to Microsoft's OLE enthusiasts, it's likely they'll think about it for a few minutes and then come up with something completely preposterous! The truth is, OLE has virtually nothing to offer products like Cinemania, and these are precisely the products that are becoming more prevalent as computers move into the home.

.....

*The power of today's
machines gives operating
system designers more
flexibility in
implementing interfaces
that are more responsive
to the user.*

.....

Let me state this clearly: If you are writing an application that easily lends itself to using OLE, you are not writing a really hot application of the future. Okay?

APPLIANCES AND TOOLS Another problem with OLE is that it treats applications as if they were merely tools that perform certain operations on the all-important document. This may sound fine in theory, but in the commercial world of software, it's a real problem. Today's software manufacturers live and die by name recognition, and few of them (including Microsoft) want to see their finely crafted applications marketed as semi-generic tools. Will software purchasing be downgraded to a decision similar to choosing whether to purchase your screwdrivers at Woolworths or Sears?

Traditional applications (word processors, spreadsheets, and so forth) are more like appliances than tools. They should work together, of course, like stereo components, but they must be more than in-

visible workers. They should have individual personalities and quirks. There's nothing wrong with that.

The more-recent multimedia CD-ROM based software is more closely akin to books, records, and reference material. That's why they're often referred to as *titles* rather than *programs*. This software doesn't need to integrate with anything except the operating system. Lots of leeway in the design of the user interface should be allowed and encouraged. These programs should be works of art, and if you look at Microsoft's own CD-ROM products you'll find quite a bit of variation in design based on content.

INTERFACES OF THE FUTURE Whatever we do, we can't stop improving the user interface. In a very real sense, better user interfaces follow higher technologies. A few examples will prove this point:

- With nondesktop environments, dumb terminals are attached to mainframes and minicomputers through slow cables. This prevents any reasonable speed of interaction between the user and the computer. Thus, things such as interactive spreadsheets are virtually inconceivable.
- In the early days of personal computers, many users had character-only monochrome displays, and the rest of them had low-resolution Color Graphics Adapters. Graphical interfaces were not reasonable until the advent of the Enhanced Graphics Adapter, which brought better resolution and color to the screen.

The power of today's machines gives operating system designers more flexibility in implementing interfaces that are more responsive to the user. I'm not sure we'll ever move too far from the keyboard and mouse, however. Several other forms of interface hardware have proven themselves to be inadequate. The light pen isn't used much by anyone and the touchscreen seems now to be relegated to automated teller machines (where its clumsiness and inaccuracy are well known).

From what I've seen, voice recognition and handwriting recognition are still years away from reality. For the applications in which they would be most useful (personal digital assistants, for example), the accuracy is still far below a minimum standard. So, for the time being, we're going to be working with Windows 95 and exploring its new interface options. □



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Power Programming

BY JEFF PROSISE

Owner-Drawn Push Buttons: Simple as M-F-C

Have you, as a programmer, ever looked at a commercial Windows application and wondered how it displays push buttons with pictures on them? Conventional Windows push buttons—the kind you get from a PUSHBUTTON statement in a dialog template or a BS_PUSHBUTTON-style window created from the BUTTON window class—display only text. Push buttons with pictures are examples of owner-drawn push buttons, which are just like regular push buttons except that your program, rather than Windows, is responsible for painting them on the screen.

Owner-drawn push buttons are created in the same way that normal push buttons are created, except they use the style BS_OWNERDRAW. When an owner-drawn push button needs to be repainted, its parent window receives a WM_DRAWITEM message. lParam holds the address of a structure of type DRAWITEMSTRUCT, which contains, among other things, information about the button state and a device-context handle for drawing. The *state* specifies whether the button is enabled or disabled, whether it has the input focus, and whether it's being pressed or not.

If you've ever written the code for an owner-drawn push button in C, you know that it's not a task for the faint-hearted. There are several different button states to contend with, and handling all of them properly is a little complicat-

ed. It seems unfair that it should be so much work just to put a picture on a button, especially when Microsoft Visual Basic and some of the other Windows programming environments make it so easy. (Owner-drawn buttons are a no-brainer in Visual Basic. All you have to do is drop a 3-D command button or 3-D group push button into a form, throw in a bitmap or two, and knowing the names of the bitmaps.) If it weren't so difficult, it's likely that more C programmers would be using owner-drawn buttons.

The owner-drawn push button is one aspect of Windows programming that's much easier when you program in C++ and use the Microsoft Foundation Classes (MFC). MFC includes a modest little class named CBitmapButton that is just what the doctor ordered when it comes to owner-drawn push buttons: a nice, neat wrapper around an owner-drawn push-button control that delegates all of the drudge work to the control itself. You create a CBitmapButton object and tell it what the push button should look like by supplying one or more bitmaps; the object, in turn, handles all the painting by BitBltting those bitmaps to the screen at the appropriate times and in response to various events.

MFC's ability to make Windows programming easier is often overhyped, but this is one example of where it lives up to its billing. With MFC's CBitmapButton class, an owner-drawn push button is only a little more work than a conventional push button. Here's how you can put CBitmapButton objects to work in your programs.

THE CBITMAPBUTTON CLASS CBitmapButton is a simple class derived from MFC's more generic CButton class, which in turn is derived from CWnd. In addition to the member functions that it inherits from classes higher in the hierarchy (including important ones such as Create) and its constructor, CBitmapButton implements three member functions: LoadBitmaps, which specifies the bitmap resources associated with a button; SizeToContent, which resizes the button to match the dimensions of the bitmap; and AutoLoad, which relies on a special naming convention to allow the CBitmapButton object to perform the equivalent of a LoadBitmaps and SizeToContent without explicitly

MFC includes a modest little class named CBitmapButton that is just what the doctor ordered when it comes to owner-drawn push buttons.

knowing the names of the bitmaps.

Each bitmap button (the term we'll use henceforth for push buttons managed by CBitmapButton) has from one to four bitmaps associated with it. The bitmaps themselves are stored as bitmap resources in the program's .EXE file. The only bitmap that's required is the one that depicts the button in

its normal, undepressed state. Bitmaps depicting the button when it is depressed, when it has the input focus, and when it is disabled may be supplied also. You'll almost always supply bitmaps corresponding to the button's up and down states. You may or may not supply the others, depending on how your buttons will be used.

How do you create a bitmap button? Easy. If the button won't be created from a dialog-box resource, but by your application (equivalent to creating a push-but-


```
#include <afxwin.h>
#include <afxext.h>
#include "buttons1.h"

CMyApp myApp;

////////////////////////////////////
// Member functions for the CMyApp class.

BOOL CMyApp::InitInstance ()
{
    m_pMainWnd = new CMainWindow ();
    m_pMainWnd->ShowWindow (m_nCmdShow);
    m_pMainWnd->UpdateWindow ();
    return TRUE;
}

////////////////////////////////////
// Member functions and message map for the CMainWindow class.

CMainWindow::CMainWindow ()
{
    Create (NULL, "CBitmapButton Demo 1", WS_OVERLAPPEDWINDOW,
        rectDefault, NULL, "MainMenu");
}

int CMainWindow::OnCreate (LPCREATESTRUCT)
{
    CRect rect;

    rect.SetRect (4, 4, 36, 36);
    m_OpenButton.Create (NULL, WS_CHILD | WS_VISIBLE | BS_OWNERDRAW,
        rect, this, IDB_OPEN);
    m_OpenButton.LoadBitmaps ("OPENU", "OPEND");

    rect.SetRect (40, 4, 72, 36);
    m_SaveButton.Create (NULL, WS_CHILD | WS_VISIBLE | BS_OWNERDRAW,
        rect, this, IDB_SAVE);
    m_SaveButton.LoadBitmaps ("SaveU", "SaveD");
    return 0;
}

void CMainWindow::OnPaint ()
{
    CRect rect;
    CPaintDC dc (this);

    GetClientRect (rect);
    rect.BottomRight().y = 40;
    CBrush brush (RGB (192, 192, 192));
    dc.FillRect (rect, &brush);
    dc.MoveTo (rect.TopLeft().x, rect.BottomRight().y);
    dc.LineTo (rect.BottomRight().x, rect.BottomRight().y);
}

void CMainWindow::OnOpen ()
{
    ::MessageBeep (MB_OK);
}

void CMainWindow::OnSave ()
{
    ::MessageBeep (MB_ICONHAND);
}

void CMainWindow::OnExit ()
{
    SendMessage (WM_CLOSE, 0, 0L);
}

BEGIN_MESSAGE_MAP (CMainWindow, CFrameWnd)
    ON_WM_CREATE ()
    ON_WM_PAINT ()
    ON_COMMAND (IDM_OPEN, OnOpen)
    ON_COMMAND (IDM_SAVE, OnSave)
    ON_COMMAND (IDM_EXIT, OnExit)
    ON_BN_CLICKED (IDB_OPEN, OnOpen)
    ON_BN_CLICKED (IDB_SAVE, OnSave)
END_MESSAGE_MAP ()
```



Figure 1: This sample C++ program, **BUTTONS1.CPP**, creates a simple frame window and places a pair of bitmap buttons in the window's client area.

```
#ifndef __BUTTONS1_H_
#define __BUTTONS1_H_

////////////////////////////////////
// Resource IDs

#define IDB_OPEN      100
#define IDB_SAVE      101

#define IDM_OPEN      110
#define IDM_SAVE      111
#define IDM_EXIT      112

////////////////////////////////////
// The CMainWindow class

class CMainWindow : public CFrameWnd
{
private:
    CBitmapButton m_OpenButton;
    CBitmapButton m_SaveButton;

public:
    CMainWindow ();

    afx_msg int OnCreate (LPCREATESTRUCT);
    afx_msg void OnPaint ();
    afx_msg void OnOpen ();
    afx_msg void OnSave ();
    afx_msg void OnExit ();

    DECLARE_MESSAGE_MAP ()
};

////////////////////////////////////
// The CMyApp class

class CMyApp : public CWinApp
{
public:
    BOOL InitInstance ();
};

#endif // __BUTTONS1_H_
```



Figure 2: This is the header file for the **BUTTONS1** program.

ton control by calling `CreateWindow` in a C program), use the following procedure.

- Draw the bitmaps for the button using the SDK Image Editor, Visual C++'s App Studio, or any paint program capable of saving 16-color .BMP files. Include the files as resources in your .EXE file using `BITMAP` statements in the resource script.
- Construct a `CBitmapButton` object, or embed a `CBitmapButton` object in your program's main window class so the `CBitmapButton` object will be constructed when the window object is constructed.

- Call `CBitmapButton::Create` to create a push-button control for the `CBitmapButton` object. Be sure to specify the `BS_OWNERDRAW` style. A good place to do this is inside your window's `OnCreate` function.
- Call `CBitmapButton's LoadBitmaps` function to load the button bitmaps.

If a bitmap button is part of a dialog box, the push-button control will be created for you when the dialog box is created. In this case, the `Create` function isn't needed; the challenge is to transform the button into a bitmap button after the fact. Here's how to go about it.

- Draw the button bitmaps as before. In the resource script file, assign each bitmap the same name as the button it will be assigned to, with a U, D, F, or X appended. For example, if the button text is "Cancel," call the bitmap depicting the button in its undepressed (up) state "CancelU." Similarly, call the bitmaps corresponding to the button's down, focused, and disabled states, "CancelD," "CancelF," and "CancelX" respectively.
- Specify a push-button control in the resource file's dialog-box template. Use the style `BS_OWNERDRAW`.

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```
#include "buttons1.h"

OpenU BITMAP openu.bmp
OpenD BITMAP opend.bmp
SaveU BITMAP saveu.bmp
SaveD BITMAP saved.bmp

MainMenu MENU {
    POPUP "&File" {
        MENUITEM "&Open...",    IDM_OPEN
        MENUITEM "&Save",        IDM_SAVE
        MENUITEM SEPARATOR
        MENUITEM "&Exit",        IDM_EXIT
    }
}
```

Figure 3: This is the resource file for the BUTTONS1 program.

- Embed a CBitmapButton object in the dialog-box class derived from CDialog or CModalDialog. The CBitmapButton object will now be created when the dialog-box object is created.

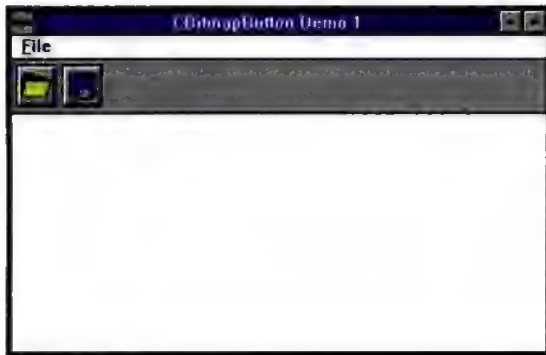


Figure 4: BUTTONS1 produces this application window, which shows button controls with bitmaps on their faces.

- Override the dialog-box object's OnInitDialog routine and include code to call CBitmapButton's AutoLoad function.

The AutoLoad function loads the bitmap resources, associates them with the button, and automatically resizes the button to fit the bitmaps. It's important to resize the button in this manner because dialog-box controls are measured in dialog box units rather than pixels. If you fail to call AutoLoad or SizeToContent, the button size probably won't match the bitmap size and the button will not be drawn properly.

Once these steps are carried out, no further action is required. Code inside the CBitmapButton class will handle WM_DRAWITEM messages and make sure your button puts on a pretty face. Your program can now treat the bitmap button just like any other push button.

BITMAP BUTTON DEMO A couple of examples will demonstrate just how easy it is to manage owner-drawn buttons with MFC. The sample program BUTTONS1, whose source code appears in Figures 1, 2, and 3 creates a simple frame window and uses the first of the two procedures outlined above to create a pair of bitmap buttons in the window's client area. (Source code files and

their related .MAK, .DEF, and .EXE files are available for downloading from PC MagNet's Programming forum archived as BUTTON.ZIP.) The bitmap buttons are arranged horizontally at the top of the window. The frame window's OnPaint function draws a shaded bar behind the buttons to create the visual equivalent of a toolbar, as seen in Figure 4.

Each bitmap button has two bitmaps associated with it: an up bitmap and a down bitmap. Toolbar buttons aren't normally allowed to receive the input focus, and nothing in the sample program allows the buttons to be disabled. Therefore, bitmaps depicting the buttons in focused

and disabled states are not necessary here. The up and down bitmaps are defined as resources with the following statements in BUTTONS1.RC:

```
OpenU BITMAP openu.bmp
OpenD BITMAP opend.bmp
SaveU BITMAP saveu.bmp
SaveD BITMAP saved.bmp
```

The .BMP files are also available for downloading from PC MagNet's Programming forum. Each .BMP file contains a 32- by 32-pixel image. The down bitmaps are identical to the up bitmaps except for the width and style of their borders and the placement of the images on the button faces, as shown in Figure 5. Down bitmaps generally place the button images down and to the right one or two pixels so the button appears to move in and out of the screen when clicked. Nothing says they have to work this way, of course. You are free to be as creative as you like. Some programs draw the button in a depressed position but leave the image on the button in the same place, outlined with a drop shadow. This makes the image appear to "float" above the face of the button and enhances the 3-D look.

BUTTONS1 uses a CMainWindow class derived from CFrameWnd as the foundation for its main window. Two CBitmapButton objects are included in CMainWindow's class definition, which resides in BUTTONS1.H:

```
class CMainWindow : public CFrameWnd
{
private:
    CBitmapButton m_OpenButton;
    CBitmapButton m_SaveButton;
```

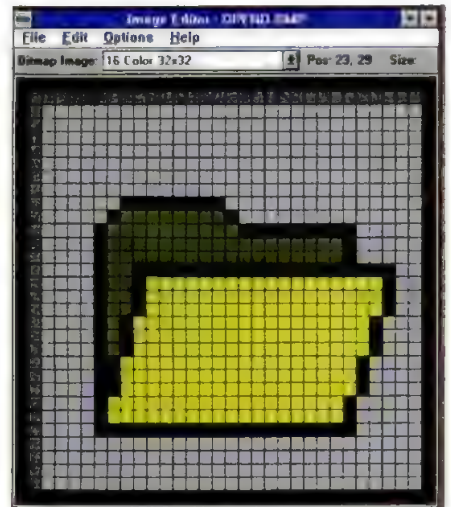
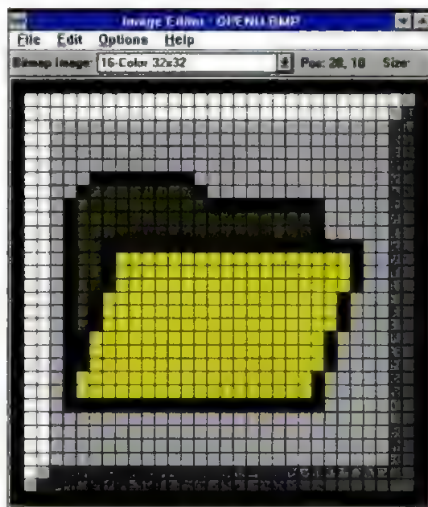


Figure 5: The down bitmap (right) is identical to the up bitmap (left) except for the width and style of its borders and the placement of the image on the button face.


```
#include <afxwin.h>
#include <afxext.h>
#include "buttons2.h"

CMyApp myApp;

// Member functions for the CMyApp class.

BOOL CMyApp::InitInstance ()
{
    m_pMainWnd = new CMainWindow ();
    m_pMainWnd->ShowWindow (m_nCmdShow);
    m_pMainWnd->UpdateWindow ();
    SetDialogBkColor ();
    return TRUE;
}

// Member functions and message map for the CMainWindow class.

CMainWindow::CMainWindow ()
{
    Create (NULL, "CBitmapButton Demo 2", WS_OVERLAPPEDWINDOW,
        rectDefault, NULL, "MainMenu");
}

int CMainWindow::OnCreate (LPCREATESTRUCT)
{
    CRect rect;

    rect.SetRect (4, 4, 36, 36);
    m_OpenButton.Create (NULL, WS_CHILD | WS_VISIBLE | BS_OWNERDRAW,
        rect, this, IDB_OPEN);
    m_OpenButton.LoadBitmaps ("OPENU", "OPEND", NULL, "OpenX");

    rect.SetRect (40, 4, 72, 36);
    m_SaveButton.Create (NULL, WS_CHILD | WS_VISIBLE | BS_OWNERDRAW,
        rect, this, IDB_SAVE);
    m_SaveButton.LoadBitmaps ("SaveU", "SaveD", NULL, "SaveX");
    return 0;
}

void CMainWindow::OnPaint ()
{
    CRect rect;
    CPaintDC dc (this);

    GetClientRect (rect);
    rect.BottomRight().y = 40;
    CBrush brush (RGB (192, 192, 192));
    dc.FillRect (rect, &brush);
    dc.MoveTo (rect.TopLeft().x, rect.BottomRight().y);
    dc.LineTo (rect.BottomRight().x, rect.BottomRight().y);
}

void CMainWindow::OnOpen ()
{
    ::MessageBeep (MB_OK);
}

void CMainWindow::OnSave ()
{
    ::MessageBeep (MB_ICONHAND);
}

void CMainWindow::OnOptions ()
{
    COptionsDlg dlg (this);
    dlg.DoModal ();
}

void CMainWindow::OnExit ()
{
    SendMessage (WM_CLOSE, 0, 0L);
}

BEGIN_MESSAGE_MAP (CMainWindow, CFrameWnd)
    ON_WM_CREATE ()
    ON_WM_PAINT ()
    ON_COMMAND (IDM_OPEN, OnOpen)
    ON_COMMAND (IDM_SAVE, OnSave)
    ON_COMMAND (IDM_OPTIONS, OnOptions)
    ON_COMMAND (IDM_EXIT, OnExit)
    ON_BN_CLICKED (IDB_OPEN, OnOpen)
    ON_BN_CLICKED (IDB_SAVE, OnSave)
END_MESSAGE_MAP ()

// Member functions and message map for the COptionsDlg class.

BOOL COptionsDlg::OnInitDialog ()
{
    m_OKButton.AutoLoad (IDOK, this);
    m_CancelButton.AutoLoad (IDCANCEL, this);
    CheckRadioButton (IDD_ENABLEOPEN, IDD_DISABLEOPEN,
        ((CMainWindow *) (myApp.m_pMainWnd))>m_OpenButton.IsWindow
        Enabled () ?
        IDD_ENABLEOPEN : IDD_DISABLEOPEN);
    CheckRadioButton (IDD_ENABLESAVE, IDD_DISABLESAVE,
        ((CMainWindow *) (myApp.m_pMainWnd))>m_SaveButton.IsWindow
        Enabled () ?
        IDD_ENABLESAVE : IDD_DISABLESAVE);
    return TRUE;
}

void COptionsDlg::OnOK ()
{
    ((CMainWindow *) (myApp.m_pMainWnd))>m_OpenButton.EnableWindow (
        IsDlgButtonChecked (IDD_ENABLEOPEN));
    ((CMainWindow *) (myApp.m_pMainWnd))>m_SaveButton.EnableWindow (
        IsDlgButtonChecked (IDD_ENABLESAVE));
    CModalDialog::OnOK ();
}

BEGIN_MESSAGE_MAP (COptionsDlg, CModalDialog)
    ON_COMMAND (IDOK, OnOK)
END_MESSAGE_MAP ()
```



Figure 6: BUTTONS2 builds upon BUTTONS1 by adding a simple dialog box that contains two bitmap buttons: an OK button with a green check mark and the letters OK, and a Cancel button with a red X and the word Cancel printed on its face.

The `m_OpenButton` and `m_SaveButton` objects are created when the `CMainWindow` object is created, but initially there is no push button associated with either of them. `CMainWindow`'s `OnCreate` member function takes care of that. The following statements in `CMainWindow::OnCreate` create a push-button control corresponding to `m_OpenButton` and load the button's up and down bitmaps:

```
rect.SetRect (4, 4, 36, 36);
m_OpenButton.Create (NULL,
```

```
WS_CHILD | WS_VISIBLE |
BS_OWNERDRAW, rect, this,
IDB_OPEN);
m_OpenButton.LoadBitmaps ("OPENU",
"OPEND");
```

The first parameter passed to `Create` specifies the button text. For bitmap buttons, this parameter will usually be `NULL`. The second parameter specifies the button style, and the third parameter specifies—via a `CRect` object or a `RECT` structure—the button's location and dimensions in client coordinates. (As an alternative to matching the rectangle coordinates to the size of the bitmap, we could have entered any coordinates for the rectangle's lower-right-hand corner

and called the `SizeToContent` function after loading the bitmaps.) The fourth parameter to `Create` identifies the parent window object, and the final parameter holds the button's control ID. The keyword `this` is a C++ programmer's way of referring to the object to which a member function belongs. Here, `Create` is called from a `CMainWindow` member function, so `this` refers to `CMainWindow`.

The parameters passed to `LoadBitmaps` specify the resource names of the button's up and down bitmaps, in that order. Had we included focused and disabled bitmaps as well, their resource names would have appeared as the third and fourth parameters.


```
#ifndef __BUTTONS2_H_
#define __BUTTONS2_H_

// Resource IDs

#define IDB_OPEN      100
#define IDB_SAVE      101

#define IDM_OPEN      110
#define IDM_SAVE      111
#define IDM_OPTIONS    112
#define IDM_EXIT      113

#define IDD_ENABLEOPEN 120
#define IDD_DISABLEOPEN 121
#define IDD_ENABLESAVE 122
#define IDD_DISABLESAVE 123

// The CMainWindow class

class CMainWindow : public CFrameWnd
{
public:
    CBitmapButton m_OpenButton;
    CBitmapButton m_SaveButton;

    CMainWindow ();

    afx_msg int OnCreate (LPCREATESTRUCT);
    afx_msg void OnPaint ();
    afx_msg void OnOpen ();
    afx_msg void OnSave ();
    afx_msg void OnOptions ();
    afx_msg void OnExit ();

    DECLARE_MESSAGE_MAP ()
};

// The COptionsDlg class

class COptionsDlg : public CModalDialog
{
private:
    CBitmapButton m_OKButton;
    CBitmapButton m_CancelButton;

public:
    // Constructor
    COptionsDlg (CWnd* pParent) :
        CModalDialog ("Options", pParent)
    {}

    BOOL OnInitDialog ();
    afx_msg void OnOK ();

    DECLARE_MESSAGE_MAP ()
};

// The CMyApp class

class CMyApp : public CWinApp
{
public:
    BOOL InitInstance ();
};

#endif // __BUTTONS2_H_
```

Figure 7: This is the header file for the BUTTONS2 program.

WHAT ABOUT TEXT? BUTTONS1 is pretty good for a start, but what if the buttons appear in a dialog box instead of a frame window? And what if you want to include text as well as images on the button faces?

BUTTONS2, whose source code appears in Figures 6, 7, and 8, builds upon BUTTONS1 by adding a simple dialog box that contains two bitmap buttons: an OK button with a green check mark and the letters *OK*, and a Cancel button with a red X and the word *Cancel* printed on its face. The dialog box, which is invoked by selecting Options from the program's File menu, is shown in Figure 9. The

radio buttons let you enable and disable the main window's toolbar buttons, so the calls to `m_OpenButton.LoadBitmaps` and `m_SaveButton.LoadBitmaps` now load bitmaps depicting the buttons in their disabled states in addition to loading the up and down bitmaps. (Look at `OPENX.BMP` or `SAVEX.BMP` with an image editor and you'll see that I created the disabled button bitmaps by tracing the outline of the images on the buttons in dark gray and shadowing the outlines in white. This is a standard technique for representing disabled buttons, but, as usual, you're free to use any technique you like.) I modeled the OK and

Cancel buttons after a pair of bitmap buttons supplied in Visual C++'s MFC samples, which themselves appear to be modeled after the stylish OK and Cancel buttons used in Borland applications' dialogs.

Unfortunately, the `CBitmapButton` class provides no mechanism for putting text on a bitmap button other than including the text in the button's bitmap. That's how I put OK and Cancel on these buttons. Take a look at `OKU.BMP` and `CANCEL.U.BMP` and you'll see exactly what I mean. So much for text. Too bad there's not a more elegant way to do it.

```
#include <windows.h>
#include "buttons2.h"

OpenU BITMAP openu.bmp
OpenD BITMAP opend.bmp
OpenX BITMAP openx.bmp
SaveU BITMAP saveu.bmp
SaveD BITMAP saved.bmp
SaveX BITMAP savex.bmp

OKU BITMAP oku.bmp
OKD BITMAP okd.bmp
OKF BITMAP okf.bmp

CancelU BITMAP cancelu.bmp
CancelD BITMAP canceld.bmp
CancelF BITMAP cancelf.bmp

MainMenu MENU (
    POPUP "&File" {
        MENUITEM "&Open...", IDM_OPEN
        MENUITEM "&Save", IDM_SAVE
        MENUITEM SEPARATOR
        MENUITEM "&Options", IDM_OPTIONS
        MENUITEM SEPARATOR
        MENUITEM "&Exit", IDM_EXIT
    }
)

Options DIALOG 32, 32, 160, 122
STYLE DS_MODALFRAME | WS_CAPTION | WS_SYSMENU
CAPTION "Options"
FONT 8, "MS Sans Serif"
BEGIN
    GROUPBOX "Open Button", -1, 12, 8, 86, 46, WS_GROUP
    CONTROL "Enable", IDD_ENABLEOPEN, "Button",
        BS_AUTORADIOBUTTON, 22, 24, 66, 10
    CONTROL "Disable", IDD_DISABLEOPEN, "Button",
        BS_AUTORADIOBUTTON, 22, 36, 66, 10
    GROUPBOX "Save Button", -1, 12, 64, 86, 46, WS_GROUP
    CONTROL "Enable", IDD_ENABLESAVE, "Button",
        BS_AUTORADIOBUTTON, 22, 80, 66, 10
    CONTROL "Disable", IDD_DISABLESAVE, "Button",
        BS_AUTORADIOBUTTON, 22, 92, 66, 10
    DEFPUSHBUTTON "OK", IDOK, 112, 12, 0, 0,
        WS_TABSTOP | WS_GROUP | BS_OWNERDRAW
    PUSHBUTTON "Cancel", IDCANCEL, 112, 48, 0, 0,
        WS_TABSTOP | WS_GROUP | BS_OWNERDRAW
END
```

Figure 8: This is the resource file for the BUTTONS2 C++ program.

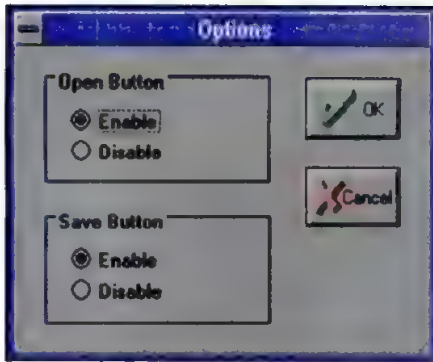


Figure 9: BUTTONS2 produces this dialog box, which both demonstrates bitmap buttons on a dialog box and allows you to disable the buttons on the main application with option buttons.

The main difference between BUTTONS1 and BUTTONS2 is that the latter derives a dialog class (COptionsDlg) from MFC's CModalDialog and includes a pair of CBitmapButton objects named m_OKButton and m_CancelButton in the class definition. The COptionsDlg class constructor calls the base class (CModalDialog) constructor to initialize the object,

and COptionsDialog's OnInitDialog function is overridden so the dialog-box controls can be initialized. COptionsDlg::OnInitDialog begins with these two statements, which initialize the bitmap button controls:

```
m_OKButton.AutoLoad (IDOK, this);
m_CancelButton.AutoLoad (IDCANCEL,
    this);
```

In BUTTONS2.RC, the OK button is assigned the title "OK." Correspondingly, the button's bitmaps are named "OKU" (the up bitmap), "OKD" (the down bitmap), and "OKF" (the focused bitmap). AutoLoad loads these bitmaps, resizes the button to match the bitmaps, and links the push-button control to the CBitmapButton object. (Had the .EXE file included a bitmap resource named "OKX," AutoLoad would have loaded it, too.) In this case, the statement

```
m_OKButton.AutoLoad (IDOK, this);
```

is equivalent to the two statements

```
m_OKButton.LoadBitmaps ("OKU",
    "OKD", "OKF");
m_OKButton.SizeToContent ();
```

But why do in two steps what you can do in one? CBitmapButton's AutoLoad function rolls LoadBitmaps and SizeToContent into one easy-to-use function. As an aside, notice that the button dimensions specified in BUTTONS2.RC are 0,0. You can specify any dimensions you want; AutoLoad will simply override them.

CONCLUSION MFC is no panacea (despite a few enthusiasts' misguided claims to the contrary), but it does make certain Windows programming tasks easier. One of those tasks is creating and managing owner-drawn buttons. If you've programmed owner-drawn buttons in C before, you'll appreciate the convenience of the CBitmapButton class and the simplicity it lends to your programs' designs. □

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BY DOUGLAS BOLING

Kick-Start Programs with DropKick

Windows 3.1 has evolved into something akin to an old car—still running but not the prettiest thing on the block. Just starting a program is a pain: You scan your many Program Manager groups to find one buried program icon. In OS/2's Workplace Shell, a click of a menu button can launch a program. Wouldn't it be nice if you could start a Windows program as easily as on your friends' newer operating systems? Now you can, with DropKick!

DropKick is a Windows 3.1 utility that lets you launch your favorite Windows programs with the click of a mouse button. Just click on an empty spot on the desktop to bring up a user-configurable menu containing your favorite programs. Selecting a menu item causes DropKick to launch the program quickly and easily.

To add a program to the DropKick menu, just open the File Manager and drag a file's icon from the File Manager to the DropKick window. If the file is a data file instead of a program, DropKick will find the proper program to open the file and automatically include it on the command line. For finer control over how a program is started (for example to set the default startup directory or tell DropKick to start a program as an icon) menu items also can be created through a dialog box interface.

Not only is the menu configurable, but so is DropKick itself. You can specify which mouse button brings up the Drop-

Kick menu. If you have a three-button mouse, you can use that all-but-forgotten middle button. You can also require that a click be qualified by either the Ctrl key, the Shift key, or both.

You can obtain your own copy of DropKick by downloading it from PC MagNet. See the sidebar "Guide to Our Utilities & How To Get Them" for details. For the programmers out there, the source files are also available so you can make modifications if you choose. DropKick was written for Microsoft C 6.0, and should work with any Microsoft C or compatible compiler. Make files are provided for the Microsoft C 6.0 and Borland C++ 3.1 compilers.

USING DROPKICK As with most of *PC Magazine's* growing library of Windows

utilities, installing DropKick is a very simple process. Just copy the two DropKick files, DKICK.EXE and DKDLL.DLL, into a directory on your hard disk. You can create an icon for DropKick by selecting the File | New menu item on the Program Manager. If you want DropKick to be started every time you start Windows, put the icon in your Startup group.

When DropKick starts the first time, it displays the standard DropKick window (Figure 1). In the window, you will see an empty list box that will contain the menu selections, and a set of buttons along the right side of the window. From top to bottom, the buttons are Add, Delete, Edit, Configure, About, and Exit.

To quickly add a program to the list, just drag a program from the File Manager and drop it into the DropKick window. You will see the name of the program appear in the DropKick list box. Now find an empty spot on the desktop and click the right mouse button. The DropKick menu will appear with the name of the program you dropped onto the DropKick window. Select the program with the left mouse button (under Windows, all menu selections must be made with the left mouse button); the menu will disappear and the program will start.

Click on the desktop to bring up the DropKick menu again. You will notice a menu item labeled "DropKick." Selecting it will display a submenu with two menu items: Configure DropKick and About DropKick. Selecting the About DropKick menu item displays the DropKick About box with the copyright notice and the author's name.

Selecting the Configure DropKick menu item will bring the DropKick menu back to the foreground. If you had minimized DropKick, its window will be restored. Now that we are back at the DropKick window, it's a good time to review the controls on the window.

The top button on the window is the Add button. Clicking on it will bring up the Add dialog box so that you can manually enter menu items. There are three entry fields in the dialog: Menu Name, Command, and Working Directory. With these you can enter the details for a menu item. The menu name field allows you to have a different menu name from the name of the program you are starting. For

Top 10 Utilities

Rank	Utility
1	FDDLLS - Finds dead DLLs
2	WTIME - Keeps PC clock accurate
3	INCTRL - Controls Windows installation
4	FINDIR - IRQ line analysis
5	PCMKEY - Command line editor
6	BUGS - Windows 3.1 screen saver
7	PASTE - Enhanced Windows clipboard
8	WPNT - Highlights Windows presentations
9	MYGRPS - Customizes group icons
10	WINCMD - Command file interpreter

This list is based on the total number of downloads each utility has had on PC MagNet over the past month. To download these files, type GO ZNT:TIPS. For more information, see the sidebar "Guide to Our Utilities & How to Get Them."



Figure 1: DropKick's main window and configuration dialog box let you start your applications with a click of the mouse button of your choice.

example, you could put WINMINE.EXE as the command line, but "MineSweeper" as the Menu Name. The working directory field is handy for those programs that must be started from their own directory. When starting a program, DropKick will first set the default directory to the directory listed in the Working directory field.

At the bottom of the Add dialog is a check box labeled Run Minimized. Setting this check box will tell DropKick to start the program as an icon. When the check box is cleared, DropKick will start the program as a standard window.

There are three push buttons on the right side of the Add dialog. The Browse button brings up a browse dialog that can help you find the program to add. The Cancel button closes the dialog without saving any of the data in the dialog. The Add button causes DropKick to save the new program details in the list of menu items.

Before saving the data, DropKick verifies that the command is a program or has an association and that the working directory exists. If DropKick can not find the program or directory, a message box is displayed notifying you of the problem, and you are returned to the Add dialog to correct the problem.

Unless you have selected one of the items in the DropKick list box, the next two buttons, Delete and Edit, will be disabled. To test the Delete button, select one of the items in the list box and click on the Delete button. You will see a message box asking you if you want to delete the selected item. Selecting Yes will delete the item; selecting No will return you to

the main window without taking any action.

Clicking on the Edit button will bring up a dialog very similar to the Add dialog, except this time, the fields will be initialized with the data from the selected item. You can make any changes to the data and select Save to save the changes.

If you take a moment to edit an item you created by dropping a program from the File Manager, you can see how DropKick fills in the fields for these menu items. If an executable file was dropped, the command field is filled with the fully qualified file-

name that was dropped. Otherwise, the program associated with the data file that was dropped is added to the command before the data filename. The Working directory is the directory that contained the file. The Menu text is the name of the program, stripped of any extension. The Menu text will be in lowercase except for a capitalized first character.

The Configure button on the main window displays a dialog that allows you to specify what combination of mouse button and shift keys brings up the DropKick menu. The dialog contains three

radio buttons, each representing one of the buttons on your mouse. You can select the middle button even if you have only a two-button mouse, but since the button does not exist, you will not have a way to pop up the menu!

Two check boxes, Ctrl and Shift, allow you to qualify the mouse click with a shift combination. By clicking on these check boxes, you can specify that the menu appear only when the click is accompanied by either a Ctrl key, a Shift key or, by checking both boxes, both a Ctrl and Shift. The new shift combination will be in effect as soon as you click on the Exit button. A click on the Cancel button will discard any changes you have made.

The last two buttons on the main window, About and Exit, perform as you would expect. The About button displays the About box; the Exit button ends DropKick. Normally, you won't press Exit after making configuration changes; you will simply minimize DropKick.

INSIDE DROPKICK There are essentially three tasks that DropKick must accomplish to provide its function to the user. First, the DropKick window must provide a method for configuring the menu. The mouse clicks must be detected and the menu created. Finally, if a menu item is

```
UINT DragQueryFile(hDrop, iFile, lpzFile, cb)
```

```
HDROP hDrop;           // handle of structure for dropped files
UINT iFile;             // index of file to query
LPSTR lpzFile;          // address of buffer for returned filename
UINT cb;               // size of buffer for filename
```

The DragQueryFile function retrieves the number of dropped files and their filenames.

Parameter	Description
hDrop	Identifies the internal data structure containing filenames for the dropped files. This handle is passed to the application in the wParam parameter of the WM_DROPFILES message.
iFile	Specifies the index of the file to query. The index of the first file is 0. If the value of the iFile parameter is -1, DragQueryFile returns the number of files dropped. If the value of the iFile parameter is between zero and the total number of files dropped, DragQueryFile copies the filename corresponding to that value to the buffer pointed to by the lpzFile parameter.
lpzFile	Points to a null-terminated string that contains the filename of a dropped file when the function returns. If this parameter is NULL and the iFile parameter specifies the index for the name of a dropped file, DragQueryFile returns the required size, in bytes, of the buffer for that filename.
cb	Specifies the size, in bytes, of the lpzFile buffer.
Returns	When the function copies a filename to the lpzFile buffer, the return value is the number of bytes copied. If the iFile parameter is 0xFFFF, the return value is the number of dropped files. If iFile is between zero and the total number of dropped files and if lpzFile is NULL, the return value is the required size of the lpzFile buffer.

Figure 2: Shown here is a description of the DragQueryFile function.


```
#define MAXENTRIES 32

char szFileName[MAXENTRIES][128];

//-----
// DoDropFilesMain - process WM_DROPFILES message.
//-----
LONG DoDropFilesMain (HWND hwnd, UINT wMsg, UINT wParam, LONG lParam) {
    INT i, sFiles;

    // Get the number of files dropped on the window
    sFiles = DragQueryFile ((HDROP) wParam, -1, 0, 0);

    // Make sure not too many files being dropped
    if (sFiles > MAXENTRIES)
        PrintError (hwnd, ERR_MAXSCH);
        return 0;
    }

    // Loop though, copying each file name into an array
    for (i = 0; i < sFiles; i++) {
        // Get name of dropped file
        DragQueryFile ((HDROP) wParam, i, szFileName[i],
            sizeof (szFileName[i]));
    }

    // Signal that we are done with the drop structure
    DragFinish ((HDROP) wParam);

    // Call program specific routine to act on dropped files
    DoStuffToDroppedFiles(sFiles);

    // Return from the WM_DROPFILES message
    return 0;
}
```



Figure 3: This is a generic code fragment that processes the WM_DROPFILES message.

selected, the program must be launched.

The DropKick window is implemented using a dialog box. This frees the program from having to create all the child windows for each of the controls on the main window. Other than creating the dialog with a CreateDialog call instead of a CreateWindow, there is not much of interest to talk about in the main window—except, of course, DropKick's ability to accept files dropped from the File Manager.

The drag-and-drop action for DropKick is quite simple to implement. The entire function requires only a few calls to three Windows drag-and-drop functions. The first call, DragAcceptFiles, takes two parameters: the handle of the window that will accept the files and a flag indicating whether the window is enabling or disabling drag-and-drop for that window. In DropKick, DragAcceptFiles is called during the WM_CREATE message to enable drag-and-drop and during WM_DESTROY to disable drag-and-drop.

To accept dropped files, the only other task required of a window is to process the WM_DROPFILES message. This message is sent to a window when a file or set of files is dropped on it. In the routine that handles WM_DROPFILES messages, a window determines the names of the files dropped on it using a series of calls to the Windows DragQueryFile function. The syntax of the

zero-based number of the filename being queried. The hDrop parameter is the handle to an undocumented Drop Structure that contains the drag-and-drop data for the file. Fortunately (and somewhat unusual for a Microsoft operating system), the programmer does not need to know the contents of this undocumented structure to make the drag-and-drop process work. The hDrop parameter is passed to a window as the wParam value in the WM_DROPFILES message.

A program should copy the names of all dropped files during the WM_DROPFILES message. Once the filenames have been saved, a call should be made to the Windows function DragFinish, which sig-

DragQueryFile function, taken from the Windows SDK help file, is shown in Figure 2.

As you can see from the description, DragQueryFile provides two functions. If it is called with the iFile parameter equal to -1, it returns the number of files dropped on the window. Once the number of dropped files is known, DragQueryFile can be called again for each file to determine the name of that file. When called in this manner, the iFile parameter contains the

nals Windows that we are done with the drag-and-drop structure. The only parameter to the DragFinish function is the hDrop handle of the global memory containing the drag-and-drop structure.

A typical code fragment that might process the WM_DROPFILES message is shown in Figure 3. I have used this generic example instead of the actual code in DropKick for clarity.

In DropKick, the only additional code in the WM_DROPFILES routine deals with determining the file association if the file is not an executable file. Fortunately, this task is accomplished by one call to the Windows function FindExecutable. This function checks the associations kept in WIN.INI that relate a file extension with a program. FindExecutable returns the name of the associated program for any file with an extension registered in WIN.INI. DropKick uses FindExecutable to verify either that the file is a program or that an association to a program exists.

Detecting the mouse click on the desktop is the responsibility of the DKDLL.DLL file that accompanies the DropKick

..... .EXE file, DKICK-
.EXE. The DLL is necessary because DropKick monitors the mouse clicks by subclassing the desktop window. While subclassing a window normally doesn't require the subclass routine to be contained in a DLL, the subclass routine must be in a DLL when the desktop window is subclassed.

*Since DropKick must
monitor mouse clicks
by subclassing the desktop
window, it needs the
help of a dynamic
link library.*

Every window has a window procedure to process messages, and the address of this procedure is kept in a private data structure handled by Windows. Most of the window structure is inaccessible, but the window procedure address can be read and written using the GetWindow-

```
//-----
// MySubClassWindow - Subclasses a window
//-----
WNDPROC MySubClassWindow (HWND hwnd, WNDPROC lpfnNewProc) {
    WNDPROC lpfnOldProc;

    lpfnOldProc = (WNDPROC) GetWindowLong (hwnd, GWL_WNDPROC);
    SetWindowLong (hwnd, GWL_WNDPROC, (LONG) lpfnNewProc);
    return lpfnOldProc;
}
```

Figure 4: This function subclasses a window.



Long/SetWindowLong functions. Subclassing involves using these functions to change the window procedure address to a different routine. A function to subclass a window can be created with two simple functions, as shown in Figure 4.

In this routine, a call is made to GetWindowLong to get the current window procedure pointer. Then a call is made to SetWindowLong to write the new pointer to the window structure. The old window procedure must be saved, since the subclass procedure must pass any messages it does not process along to the old window procedure for processing them. In the case of DropKick, only one kind of message is checked: one indicating a mouse click.

The desktop subclass routine waits until the proper mouse message, WM_xBUTTONDOWN, is received (*x* is a place holder for L, M, or R, which signify which button is being clicked). The wParam value passed to a window with the BUTTONDOWN message contains flags indicating, among other items, whether the Ctrl and Shift keys

are being held down. This makes it almost trivial to know when to display the DropKick menu. The subclass routine checks for the WM_xBUTTONDOWN

.....

*Displaying a menu on
the fly requires that the
menu be created and
then displayed using a
variety of menu functions
available through the
Windows API.*

.....

message and then, if necessary, checks the state of the Ctrl and Shift keys. If the proper combination is detected, the menu is displayed.

Displaying a menu on the fly requires that the menu be created and then dis-

played using a variety of menu functions available through the Windows API. First an empty menu is created using the CreatePopupMenu function. Next, individual menu items are added using the AppendMenu function for each of the programs the user has added to the menu list. A separator menu item is then added to the menu using the AppendMenu function. Finally, a separate submenu is created for the DropKick menu items, again using the CreatePopupMenu and AppendMenu functions. The submenu is then appended to the main pop-up menu using—you guessed it—yet another call to AppendMenu.

Once the menu has been created, DropKick must display it, track the mouse as it selects the proper menu item, destroy the menu if the user clicks somewhere else, or send a WM_COMMAND message if the user selects a menu item. Sound complex? As Arnold Schwarzenegger might say, "No problemo." One call to the Windows function TrackPopupMenu handles all these tasks. The function displays the menu,

SOFTWARE PIRATES:
(AND YOU KNOW WHO YOU ARE)
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NUMBER SO THAT YOU
WILL BE TURNED IN.**
1-800-388-7478

DON'T
COPY
THAT
FLOPPY.

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performs all menu processing, and then removes the menu. A WM_COMMAND message is even sent if the user selects a menu item. All that is left for the program is to destroy the menus using one call to the Windows function DestroyMenu.

The subclass routine then checks for a WM_COMMAND message resulting from the menu. If one is received, a mes-

sage is posted to the DropKick main window to launch the selected program.

DropKick launches the programs using the ShellExecute function. Since any associations are verified when the menu item was created, the program should launch correctly. If an error does occur, a message box is displayed indicating the problem.

Windows 3.1 may be getting a bit long

in the tooth, but fortunately its maturity enables us to become more confident in altering it to suit our needs. DropKick is a modern context-sensitive menu that can be easily added to the aging Windows shell. Try DropKick and launch yourself into action. □

DOUGLAS BOLING IS A CONTRIBUTING EDITOR
OF PC MAGAZINE.

GUIDE TO OUR UTILITIES & HOW TO GET THEM

DropKick

PURPOSE: DropKick is a Windows 3.1 utility that launches programs with the click of a mouse button. Just click on an empty spot on the desktop to bring up a user-configurable menu containing your favorite programs. Selecting a menu item causes DropKick to launch the program quickly and easily.

SETUP: To install DropKick, simply copy the files DKICK.EXE and DKDLL.DLL to a directory on your hard disk. Launch DropKick by selecting the File | Run menu item in Program Manager. After the DropKick window is displayed, click on the Add button to add programs to the pop up menu. You can also add programs to the menu by dragging and dropping them from File Manager to the DropKick window. If a nonexecutable file is added to the menu, DropKick will query Program Manager for a valid association for the file.

REMARKS: The default setting for DropKick is to pop-up when the right mouse button is clicked on the desktop. To change the mouse button, click on the Configure button in the DropKick menu.

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

HARDWARE

Printer Coexistence

❓ I read a tip in the Solutions column in your April 12, 1994, issue that dealt with adding a second parallel port to handle a second printer. You mentioned potential conflicts with IRQ5 (normally assigned to LPT2); this would have been the case in my computer since I've assigned that interrupt to a Logitech bus mouse. I had been considering the mechanical switch-box solution but decided to go the second-parallel-port route after reading the warning about the hazards of mechanical boxes.

When I installed the second port, I tried setting it to IRQ7 (the same as LPT1), figuring that I can't print on two printers at the same time (can I?), so how could there be any IRQ conflicts? Even if I could use both printers at once, I can't think why I would. So far, my solution works very well! Both printers function, and I haven't had any conflicts. Is there anything wrong with setting up my system this way?

Mike Palmer
via Fax

► **PC MAGAZINE:** I don't think I would have thought of assigning both parallel ports to the same IRQ, but I can't think of any reason why it shouldn't work as long as you only use one at a time.

This problem comes up all the time with serial ports, since the odd COM ports typically share IRQ4 and the even ones share IRQ3. If you need to hook up more than two serial devices, the standard solution is to choose two devices that you won't use at the same time and put them on the same interrupt. The same strategy should work just fine for two parallel ports as well.

As for your not expecting to use both

printers at once, however, I suspect you must only print very short documents or you're not a heavy Windows user. One advantage of Windows is that you can indeed do more than one thing at a time with your computer, and I can think of many instances where I might want to shoot out a quick printout to a dot matrix printer while my laser printer is tied up printing a large graphic or long document. As long as you need to use only one printer at a time, though, I expect that your current settings will continue to work without a problem.

—Alfred Poor

Faster Math for a Laptop

❓ I own a Toshiba Satellite T1900C notebook, which uses a 20-MHz 486SX chip. Recently, I bought a CAD program that requires a math coprocessor. Short of buying a new computer, is there anything I can do to run this program? Is there a software utility or PCMCIA card or anything else I can use on this computer to fool the software into thinking that a math coprocessor is present?

Shevach Adi
Beit-Shemesh, Israel

► **PC MAGAZINE:** Unfortunately, I can find no solution for this problem. The Intel 80486 line includes on-chip math co-

processor circuitry *except* for its SX model. The only way to add math coprocessor functionality would be to replace the SX chip with a DX unit of the same speed or to add an 80487 in a socket built for that purpose. Some laptops have such a socket, but your T1900C is not one of them.

There are a number of math coprocessor emulator utilities, but these are designed exclusively for the 286 and 386 chip families; I can't find an equivalent program for 486 chips. In any case, such an emulator would be of limited value since you wouldn't get the processing boost of a real math coprocessor. Since your CPU would still have to do all the work by itself, the program would likely run more slowly than you'd want.

The best answer here is to get a different computer. Anything with a 486DX will do and will likely be considerably faster than your laptop. If you plan to do a lot of CAD work, you'll certainly appreciate the extra horsepower.

—Alfred Poor

The Silicon Ceiling

❓ I want to upgrade the memory of a three-year-old 386SX/16 machine. I tried putting 4Mbx9 SIMMs in place of the four 1Mbx9 SIMMs that came in the system, but the computer recognized

PC SOLUTIONS INDEX

Hardware

Printer Coexistence.....	259
Faster Math for a Laptop	259
The Silicon Ceiling.....	259
Monitor Muddle.....	269

Operating

Environments

Comparing Two Paths in a	
--------------------------	--

Batch File	269
------------------	-----

Word Processing

Building a Function Library in WinWord.....	274
---	-----

Spreadsheets

Ignoring Blank Cells	274
----------------------------	-----

Graphics

Crazy Colors in .CGM Files.....	278
---------------------------------	-----



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See index, page 270.

Elite Pentium™ Processor

The Power Is Building

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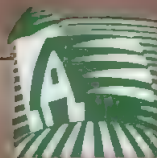
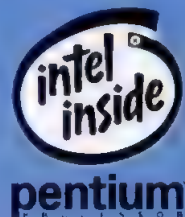
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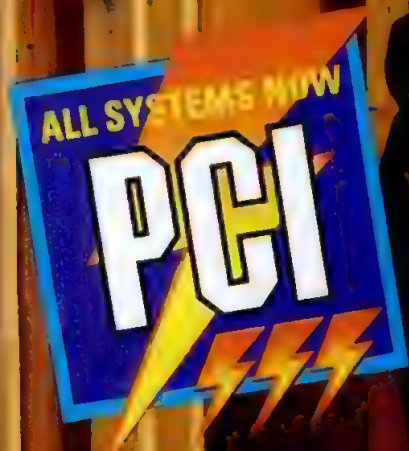
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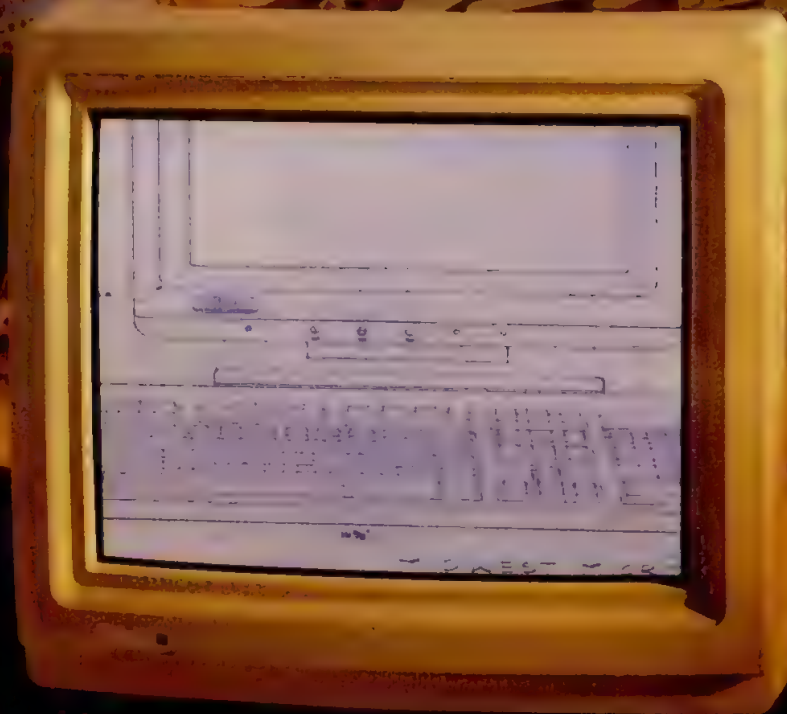
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REG

The Elite SoundBook —An Exciting Breakthrough In Portable Computing

Life is full of little surprises. One minute you're climbing the ladder of success — the next minute your world is crashing down all around you. So in order to be prepared for *your* next surprise, make sure there's always an Elite SoundBook in your toolbox. This powerful 486 notebook comes with business audio features, Advanced Power Management and your choice of screen, hard drive and processor up to DX4-100 — but it still manages to weigh in at less than seven pounds. Why did we make the Elite SoundBook so small? Because sometimes you need to get *into* a tight spot... to get *out* of one.

Features That'll Floor You

No matter how your new Elite SoundBook is configured, you'll always enjoy crystal clear audio and video. And that's definitely a must when you're working in unfamiliar surroundings. The SoundBook's special software, microphone and speaker let this amazing notebook talk you through even the toughest projects — just in case your hands are full. And since MidWest knows you've got *enough* headaches, each SoundBook comes with a crisp 9.5" monochrome, 10.3" dual-scan color or 9.5" active-matrix color display that's perfect for hours of comfortable viewing. Plus, you'll never have to worry about extension cord safety — the SoundBook's nickel metal hydride battery keeps working until the job's done!

Dig Your Phone Out Of The Wreckage And Give Us A Call

If you still think a computer system has to be a permanent fixture on your desktop, let the Elite SoundBook remodel your mind. And if you're *really* buried under your work, the Elite SoundBook Plus is available with a 75 MHz or 90 MHz Intel Pentium Processor! Calling MidWest Micro may have been the smartest decision Eugene ever made. Who knows, he might even have time to clean the attic before his wife comes home.

"The Elite SoundBook DX4-100 is the fastest notebook we have ever tested."

— *Mobile Office*, November 1994

"A 100 MHz DX4 CPU coupled with a speedy hard drive give this portable more muscle than any we've tested."

— *PC Computing*, January 1995



**MIDWEST
MICRO**

IT'S IN OUR NATURE
Systems

1-800-682-7256

Peripherals

1-800-445-2794

Minutes ago, Eugene had no idea that his dining room ceiling couldn't support a 50 pound chandelier. He also had no idea how filthy his attic really was. Now he is painfully aware of both. He is also painfully aware that his wife is due home in less than one hour. Luckily, his SoundBook survived the mishap.



Elite Home PCs

486DX2-50 \$1499

- #008701
- ▶ Intel 486™ DX2-50 Processor
 - ▶ 4 Mb RAM, 128 Kb Cache
 - ▶ 128 Mb IDE Hard Drive
 - ▶ PCI Local Bus Graphics with 1 Mb
 - ▶ PCI Fast IDE Interface
 - ▶ Double Speed CD-ROM Drive
 - ▶ Microsoft® Family Bundle — Encarta™, Works, Money, Scenes, Dangerous Creatures & Golf
 - ▶ 16-Bit Stereo Sound Card
 - ▶ Digital Quality Speakers
 - ▶ 9624 Fax Modem with Voicemail
 - ▶ 3.5" Disk Drive
 - ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT
 - ▶ 8-Bay Mini-Tower Case
 - ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots
 - ▶ 101-Key Enhanced Keyboard
 - ▶ Microsoft Mouse
 - ▶ MS-DOS® 6.22 and WFW 3.11
 - ▶ EPA Energy Star Compliant
 - ▶ The Real 3 Year Warranty

486DX2-66 \$1599

#008702

486DX4-100 \$1999

- #008703
- ▶ IntelDX4™ 100 Processor
 - ▶ 8 Mb RAM, 128 Kb Cache
 - ▶ 545 Mb IDE Hard Drive
 - ▶ PCI Local Bus Graphics with 1 Mb
 - ▶ PCI Fast IDE Interface
 - ▶ Double Speed CD-ROM Drive
 - ▶ Microsoft Family Bundle — Encarta, Works, Money, Scenes, Dangerous Creatures & Golf
 - ▶ 16-Bit Stereo Sound Card
 - ▶ Altec Lansing Stereo Speakers
 - ▶ 14.4 Fax Modem with Voicemail
 - ▶ 3.5" Disk Drive
 - ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT
 - ▶ 8-Bay Mini-Tower Case
 - ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots
 - ▶ Signature 101-Key Enhanced Keyboard
 - ▶ Microsoft Mouse
 - ▶ MS-DOS 6.22 and WFW 3.11
 - ▶ EPA Energy Star Compliant
 - ▶ The Real 3 Year Warranty

486DX4-75 \$1899

#008704

P5-75 \$2299

- #008705
- ▶ Intel® 75 MHz Pentium™ Processor
 - ▶ 8 Mb RAM, 256 Kb Cache
 - ▶ 850 Mb IDE Hard Drive
 - ▶ PCI Fast IDE Interface
 - ▶ PCI Local Bus Graphics with 1 Mb
 - ▶ Double Speed CD-ROM Drive
 - ▶ Microsoft Family Bundle — Encarta, Works, Money, Scenes, Dangerous Creatures & Golf
 - ▶ 16-Bit Stereo Sound Card
 - ▶ Altec Lansing Stereo Speakers
 - ▶ 14.4 Fax Modem with Voicemail
 - ▶ 3.5" Disk Drive
 - ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT
 - ▶ 8-Bay Mini-Tower Case
 - ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots
 - ▶ Signature 101-Key Enhanced Keyboard
 - ▶ Microsoft Mouse
 - ▶ MS-DOS 6.22 and WFW 3.11
 - ▶ The Real 3 Year Warranty

P5-60 \$2199

#008706

P5-90 \$2599

- #008707
- ▶ Intel 90 MHz Pentium Processor
 - ▶ 8 Mb RAM, 256 Kb Cache
 - ▶ 850 Mb IDE Hard Drive
 - ▶ PCI Fast IDE Interface
 - ▶ ATI MACH 64 PCI Accelerator with 2 Mb
 - ▶ Double Speed CD-ROM Drive
 - ▶ Microsoft Family Bundle — Encarta, Works, Money, Scenes, Dangerous Creatures & Golf
 - ▶ 16-Bit Wavetable Sound Card
 - ▶ Altec Lansing Stereo Speakers
 - ▶ 14.4 Fax Modem with Voicemail
 - ▶ 3.5" Disk Drive
 - ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT
 - ▶ 8-Bay Mini-Tower Case
 - ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots
 - ▶ Signature 101-Key Enhanced Keyboard
 - ▶ Microsoft Mouse
 - ▶ MS-DOS 6.22 and WFW 3.11
 - ▶ The Real 3 Year Warranty

P5-100 \$2999

#008708

- ▶ With 1 Gb Hard Drive

P5-100 \$3499

- #008709
- ▶ Intel 100 MHz Pentium Processor
 - ▶ 16 Mb RAM, 256 Kb Cache
 - ▶ 1 Gb IDE Hard Drive
 - ▶ PCI Fast IDE Interface
 - ▶ ATI MACH 64 PCI Accelerator with 2 Mb
 - ▶ Quad Speed CD-ROM Drive
 - ▶ Microsoft Family Bundle — Encarta, Works, Money, Scenes, Dangerous Creatures & Golf
 - ▶ 16-Bit Wavetable Sound Card
 - ▶ Altec Lansing Stereo Speakers with Subwoofer
 - ▶ 14.4 Fax Modem with Voicemail
 - ▶ 3.5" Disk Drive
 - ▶ 17" .28 Digital Color Monitor
 - ▶ 8-Bay Mini-Tower Case
 - ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots
 - ▶ Signature 101-Key Enhanced Keyboard
 - ▶ Microsoft Mouse
 - ▶ MS-DOS 6.22 and WFW 3.11
 - ▶ The Real 3 Year Warranty

P5-90 \$3199

#008710



Elite Office PCs

DX2-50 PCI \$1199

- #008711
- ▶ Intel 486 DX2-50 Processor
 - ▶ 4 Mb RAM, 128 Kb Cache
 - ▶ 128 Mb IDE Hard Drive
 - ▶ PCI Fast IDE Interface
 - ▶ PCI Local Bus Graphics with 1 Mb
 - ▶ 3.5" Disk Drive
 - ▶ 14" SVGA .28 NT Color Monitor with Hitachi CRT
 - ▶ 8-Bay Mini-Tower Case
 - ▶ 3 ISA, 2 PCI & 1 PCI/ISA Slots
 - ▶ Super I/O using 16550 UART & ECP/EPP
 - ▶ 101-Key Enhanced Keyboard
 - ▶ High-Resolution Mouse
 - ▶ MS-DOS 6.22 and WFW 3.11
 - ▶ MS® Works for Windows™ 3.0
 - ▶ EPA Energy Star Compliant
 - ▶ The Real 3 Year Warranty

DX2-66 PCI \$1299

#008712

DX2-50 PCI \$1499

- #008713
- ▶ IntelDX2 50 Processor
 - ▶ 4 Mb RAM, 128 Kb Cache
 - ▶ 545 Mb IDE Hard Drive
 - ▶ PCI Fast IDE Interface
 - ▶ PCI Local Bus Graphics with 1 Mb
 - ▶ Double Speed CD-ROM Drive
 - ▶ 9624 Fax Modem with Voicemail
 - ▶ 3.5" Disk Drive
 - ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT
 - ▶ 8-Bay Mini-Tower Case
 - ▶ 3 ISA, 2 PCI & 1 PCI/ISA Slots
 - ▶ Super I/O using 16550 UART & ECP/EPP
 - ▶ 101-Key Enhanced Keyboard
 - ▶ High-Resolution Mouse
 - ▶ MS-DOS 6.22 and WFW 3.11
 - ▶ MS Word 6.0, Bookshelf® '94, Encarta, Works Multimedia Edition 3.0 & Money 3.0
 - ▶ EPA Energy Star Compliant
 - ▶ The Real 3 Year Warranty

DX2-66 PCI \$1599

#008714

DX4-75 PCI \$1799

- #008715
- ▶ IntelDX4 75 Processor
 - ▶ 8 Mb RAM, 128 Kb Cache
 - ▶ 545 Mb IDE Hard Drive
 - ▶ PCI Fast IDE Interface
 - ▶ PCI Local Bus Graphics with 1 Mb
 - ▶ Double Speed CD-ROM Drive
 - ▶ 14.4 Fax Modem with Voicemail
 - ▶ 3.5" Disk Drive
 - ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT
 - ▶ 8-Bay Mini-Tower Case
 - ▶ 3 ISA, 2 PCI & 1 PCI/ISA Slots
 - ▶ Super I/O using 16550 UART & ECP/EPP
 - ▶ Signature 101-Key Enhanced Keyboard
 - ▶ Microsoft Mouse
 - ▶ MS-DOS 6.22 and WFW 3.11
 - ▶ MS Word 6.0, Bookshelf® '94, Encarta, Works Multimedia Edition 3.0 & Money 3.0
 - ▶ EPA Energy Star Compliant
 - ▶ The Real 3 Year Warranty

DX2-66 PCI \$1749

#008716

DX4-100 PCI \$1899

#008717



All Systems with a CD-ROM include TestDrive CD Software and Microsoft Home CD Sampler

Elite Office PCs (Continued)

 DX4-100 PCI \$1999	 P5-75 \$1999	 P5-75 \$2299	 P5-90 \$2499
#008718 ▶ IntelDX4 100 Processor ▶ 8 Mb RAM, 128 Kb Cache ▶ 850 Mb IDE Hard Drive ▶ PCI Fast IDE Interface ▶ PCI Local Bus Graphics with 1 Mb ▶ Double Speed CD-ROM Drive ▶ 14.4 Fax Modem with Voicemail ▶ 3.5" Disk Drive ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT ▶ 8-Bay Mini-Tower Case ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots ▶ Super I/O using 16550 UART & ECP/EPP ▶ Signature 101-Key Enhanced Keyboard ▶ Microsoft Mouse ▶ MS-DOS 6.22 and WFW 3.11 ▶ MS Word 6.0, Bookshelf '94, Encarta, Works Multimedia Edition 3.0 & Money 3.0 ▶ EPA Energy Star Compliant ▶ The Real 3 Year Warranty	#008719 ▶ Intel 75 MHz Pentium Processor ▶ 8 Mb RAM, 256 Kb Cache ▶ 545 Mb IDE Hard Drive ▶ PCI Fast IDE Interface ▶ PCI Local Bus Graphics with 1 Mb ▶ Double Speed CD-ROM Drive ▶ 3.5" Disk Drive ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT ▶ 8-Bay Mini-Tower Case ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots ▶ Super I/O using 16550 UART & ECP/EPP ▶ Signature 101-Key Enhanced Keyboard ▶ Microsoft Mouse ▶ MS-DOS 6.22 and WFW 3.11 ▶ MS Word 6.0, Bookshelf '94, Encarta, Works Multimedia Edition 3.0 & Money 3.0 ▶ The Real 3 Year Warranty	#008721 ▶ Intel 75 MHz Pentium Processor ▶ 8 Mb RAM, 256 Kb Cache ▶ 850 Mb IDE Hard Drive ▶ PCI Fast IDE Interface ▶ ATI MACH 64 PCI Accelerator with 2 Mb ▶ Double Speed CD-ROM Drive ▶ 14.4 Fax Modem with Voicemail ▶ 3.5" Disk Drive ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT ▶ 8-Bay Mini-Tower Case ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots ▶ Super I/O using 16550 UART & ECP/EPP ▶ Signature 101-Key Enhanced Keyboard ▶ Microsoft Mouse ▶ MS-DOS 6.22 and WFW 3.11 ▶ MS Word 6.0, Bookshelf '94, Encarta, Works Multimedia Edition 3.0 & Money 3.0 ▶ The Real 3 Year Warranty	#008722 ▶ Intel 90 MHz Pentium Processor ▶ 8 Mb RAM, 256 Kb Cache ▶ 545 Mb IDE Hard Drive ▶ PCI Fast IDE Interface ▶ ATI MACH 64 PCI Accelerator with 2 Mb ▶ Double Speed CD-ROM Drive ▶ 14.4 Fax Modem with Voicemail ▶ 3.5" Disk Drive ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT ▶ 8-Bay Mini-Tower Case ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots ▶ Super I/O using 16550 UART & ECP/EPP ▶ Signature 101-Key Enhanced Keyboard ▶ Microsoft Mouse ▶ MS-DOS 6.22 and WFW 3.11 ▶ MS Office Professional, Bookshelf '94 & Encarta ▶ The Real 3 Year Warranty
	P5-60 \$1899 #008720		

 P5-90 \$2999	 P5-90 \$3499	 P5-100 \$3999
#008723 ▶ Intel 90 MHz Pentium Processor ▶ 16 Mb RAM, 256 Kb Cache ▶ 850 Mb IDE Hard Drive ▶ PCI Fast IDE Interface ▶ ATI MACH 64 PCI Accelerator with 2 Mb ▶ Double Speed CD-ROM Drive ▶ 28.8 S/R Fax Modem ▶ 3.5" Disk Drive ▶ 15" SVGA .28 Digital Color Monitor with Hitachi CRT ▶ 8-Bay Mini-Tower Case ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots ▶ Super I/O using 16550 UART & ECP/EPP ▶ Signature 101-Key Enhanced Keyboard ▶ Microsoft Mouse ▶ MS-DOS 6.22 and WFW 3.11 ▶ MS Office Professional, Bookshelf '94 & Encarta ▶ The Real 3 Year Warranty	#008725 ▶ Intel 90 MHz Pentium Processor ▶ 16 Mb RAM, 256 Kb Cache ▶ 1 Gb IDE Hard Drive ▶ PCI Fast IDE Interface ▶ ATI MACH 64 PCI Accelerator with 2 Mb VRAM ▶ Quad Speed CD-ROM Drive ▶ 14.4 Fax Modem with Voicemail ▶ 3.5" Disk Drive ▶ 17" .28 Digital Color Monitor ▶ 10-Bay Full-Tower Case ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots ▶ Super I/O using 16550 UART & ECP/EPP ▶ Microsoft Natural Keyboard ▶ Microsoft Mouse ▶ MS-DOS 6.22 and WFW 3.11 ▶ MS Office Professional, Bookshelf '94 & Encarta ▶ The Real 3 Year Warranty	#008726 ▶ Intel 100 MHz Pentium Processor ▶ 16 Mb RAM, 256 Kb Cache ▶ 1 Gb IDE Hard Drive ▶ PCI Fast IDE Interface ▶ ATI MACH 64 PCI Accelerator with 2 Mb VRAM ▶ Quad Speed CD-ROM Drive ▶ 28.8 S/R Fax Modem ▶ 3.5" Disk Drive ▶ 17" .26 1600 x 1200 ExactMatch Color Monitor ▶ 10-Bay Full-Tower Case ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots ▶ Super I/O using 16550 UART & ECP/EPP ▶ Microsoft Natural Keyboard ▶ Microsoft Mouse ▶ MS-DOS 6.22 and WFW 3.11 ▶ MS Office Professional, Bookshelf '94 & Encarta ▶ The Real 3 Year Warranty
P5-75 \$2799 #008724		

 P5-100 \$4199
#008727 ▶ Intel 100 MHz Pentium Processor ▶ 16 Mb RAM, 256 Kb Cache ▶ 1 Gb IDE Hard Drive ▶ PCI Fast IDE Interface ▶ ATI MACH 64 PCI Accelerator with 2 Mb VRAM ▶ Quad Speed CD-ROM Drive ▶ 16-Bit Wavetable Sound Card ▶ Altec Lansing Stereo Speakers with Subwoofer ▶ 28.8 S/R Fax Modem ▶ 3.5" Disk Drive ▶ 17" .26 1600 x 1200 ExactMatch Color Monitor ▶ 10-Bay Full-Tower Case ▶ 4 ISA, 2 PCI & 1 PCI/ISA Slots ▶ Super I/O using 16550 UART & ECP/EPP ▶ Microsoft Natural Keyboard ▶ Microsoft Mouse ▶ MS-DOS 6.22 and WFW 3.11 ▶ MS Office Professional, Bookshelf '94 & Encarta ▶ The Real 3 Year Warranty

Monitor & Keyboard Upgrades

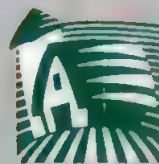
Ask your sales representative how you can upgrade your monitor to a 15" or a 17" Elite Monitor and your keyboard to a Microsoft Natural Keyboard.

14" to 15"	\$69
15" to 17"	\$249
15" to 17" ExactMatch	\$339
17" to 21" ExactMatch	\$769
Microsoft Natural Keyboard	\$59



Customizing Your System

If you don't see a system configuration which meets your needs, we'll be glad to customize a system for you. Choose your own case design, amount of RAM, hard drive size and other add-ons such as modems and multimedia kits.



MIDWEST MICRO

IT'S IN OUR NATURE

Systems

1-800-682-7256

Peripherals

1-800-445-2794

Elite SoundBook Plus Based On Intel's Pentium™ Processor



- ▶ Intel® Pentium® 90 or 75 MHz Processor
- ▶ 64 Bit, 256k Synchronous Burst External Cache
- ▶ 64-Bit, 8 Mb RAM (expands to 40 Mb)
- ▶ 10.3" Dual-Scan or 10.4" Active-Matrix VGA Display

- ▶ PCI Local Bus HDD Controller (Sound Blaster & Windows™ Sound System Compatible)
- ▶ Built-in Stereo Speakers & Microphone
- ▶ External Jacks for Line In & Line Out
- ▶ 3.5" Built-in Disk Drive
- ▶ User Replaceable Hard Drive
- ▶ Two Type II/One Type III PCMCIA Slot
- ▶ NiMH Battery & AC Adapter
- ▶ Advanced Power Management
- ▶ Bi-directional EPP/ECP Parallel Port
- ▶ High Speed 16550 UART Serial Port
- ▶ Infra Red Wireless "IR" Interface
- ▶ External VGA & Keyboard/Mouse Port
- ▶ MS-DOS® 6.22 & WFW 3.11
- ▶ Microsoft® Works for Windows 3.0 & 4.0
- ▶ Lotus® Organizer
- ▶ Weight: 6.8 lbs
- ▶ Carrying Case
- ▶ One Year Manufacturer's Warranty

Dual-Scan Color SoundBook Plus

P5-75 with 340 Mb HDD	#008090	\$2999
P5-90 with 340 Mb HDD	#008029	\$3599
P5-90 with 520 Mb HDD	#008025	\$3799
P5-90 with 720 Mb HDD	#008026	\$3999

Active-Matrix Color SoundBook Plus

P5-75 with 340 Mb HDD	#008091	\$4499
P5-90 with 520 Mb HDD & 16 Mb of RAM	#008027	\$5499
P5-90 with 720 Mb HDD & 24 Mb of RAM	#008028	\$5999



5 6 7 8 9 10 11 12

Elite SoundBook



- ▶ Intel i86™, Intel iDX2™ or Intel iDX1™ Processor
- ▶ 4 Mb RAM (expands to 20 Mb)
- ▶ 9.5" Mono, 10.3" Dual-Scan or 9.5" Active-Matrix VGA Display
- ▶ Local Bus Video with 1 Mb Video DRAM
- ▶ Business Audio Features Including Built-in Microphone & Speaker
- ▶ External Jacks for Line In & Line Out
- ▶ 3.5" Built-in Disk Drive
- ▶ User Replaceable Hard Drive
- ▶ Two Type II/One Type III PCMCIA Slot
- ▶ Built-in Trackball
- ▶ NiMH Battery & AC Adapter
- ▶ Advanced Power Management
- ▶ One Parallel & One Serial Port
- ▶ External VGA & Keyboard Port
- ▶ MS-DOS 6.22 & WFW 3.11
- ▶ Microsoft® Works for Windows 3.0 & 4.0
- ▶ Lotus® Organizer
- ▶ Weight: Mono-6.2 lbs. Color-6.7 lbs.
- ▶ Carrying Case
- ▶ One Year Manufacturer's Warranty

Dual-Scan Color SoundBook

486SX-33 with 260 Mb HDD	#008065	\$1999
DX2-50 with 340 Mb HDD	#008066	\$2099
DX2-66 with 520 Mb HDD & 8 Mb of RAM	#008067	\$2499
DX4-75 with 520 Mb HDD & 8 Mb of RAM	#008068	\$2699
DX4-100 with 520 Mb HDD & 12 Mb of RAM	#008070	\$2999
DX4-100 with 700 Mb HDD, 12 Mb of RAM & PCMCIA 14.4 S/R Fax Modem	#008069	\$3199
DX4-100 with 700 Mb HDD, 20 Mb of RAM & PCMCIA 14.4 S/R Fax Modem	#008071	\$3699

Active-Matrix Color SoundBook

DX2-66 with 340 Mb HDD	#008077	\$2999
DX4-75 with 520 Mb HDD & 8 Mb of RAM	#008078	\$3499
DX4-100 with 520 Mb HDD & 12 Mb of RAM	#008079	\$3799
DX4-100 with 700 Mb HDD, 12 Mb of RAM & PCMCIA 14.4 S/R Fax Modem	#008080	\$3999
DX4-100 with 700 Mb HDD, 20 Mb of RAM & PCMCIA 14.4 S/R Fax Modem	#008081	\$4499



Options

4 Mb RAM Card	#005976	\$239
8 Mb RAM Card	#005977	\$469
16 Mb RAM Card	#005978	CALL
Car Adapter	#005979	\$59
Mobile Max PCMCIA 130 Mb HDD	#004805	\$289
Mobile Max PCMCIA 170 Mb HDD	#004806	\$345
PCMCIA 9624 Fax Modem	#001722	\$135
PCMCIA 14.4 Fax Modem	#001812	\$179
PCMCIA Combo Ethernet Adapter	#001954	\$139

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• Ask your Midwest Micro sales representative about additional hard drive, screen and processor options.

Policy: No service charge for credit card orders. Prices are subject to change. Repair or replacement of defective products is at Midwest Micro's discretion. We are not responsible for omission, typographical and photographic. Original shipping and handling fees, as well as return shipping charges, are non-refundable. There are no returns for credit after 90 days. All returns must be shipped in original packaging. Call or write Midwest Micro for more information on warranties and policies.



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Technical Support:

1-800-262-6622

Customer Service:

1-800-728-8584

Dealers Call:

1-800-682-0522

only a total of 1MB. The manual mentions only that 1Mbx9 SIMMs are allowed on this motherboard. Can I solve this problem without buying a memory extension board?

Min Oh
St. Louis, Missouri

►**PC MAGAZINE:** The widespread adoption of Windows has a lot of users struggling to hang onto their existing systems, and this often means trying to upgrade memory to 8MB or more. The hard truth, however, is that many motherboards were not designed to accept the additional memory, and it seems that yours is one of them. Just as there is no way to convert a monochrome monitor into color, it's not feasible to reengineer such a motherboard.

Moreover, even a memory expansion card would not provide a good solution to your problem. The 386SX chip is designed with only a 16-bit data bus, not the wider 32-bit bus used by the 386DX and most 486-family chips. This means that your memory card would have to go into an ISA slot, which is limited to a 16-bit data bus and a slowpoke 8-MHz clock speed.

HOW TO CONTACT US

Do you have a hardware, software, or systems problem you can't solve? Do you have a tip you think other readers could use? Perhaps you'd like a better understanding of how something works. If so, we invite you to tell us about it. Our experts can give you practical solutions to your problems, provide techniques for using your software and hardware more productively, and help you grasp computer concepts and understand the latest technology.

It's easy to contact us. Just send us your submission (use ASCII format for text files) via the medium that's most convenient for you:

U.S. Mail: Solutions, *PC Magazine*, One Park Ave., New York, NY 10016-5802. (Please send a floppy disk along with a printout.)

Fax: 212-503-5799.

MCI Mail: Solutions, 556-3896

CompuServe: 72241,104.

Internet: 556.3896@mcimail.com.

PC MagNet: Select Submissions to *PC Magazine* from the main PC MagNet menu. Upload your file to the most appropriate library. If at any time you need help, simply type a question mark (?) and hit Enter; a list of commands will be displayed. If you are not already a member of PC MagNet but would like to join, follow the instructions on page 12 to find your local access number.

CompuServe Members: If you're a CompuServe member, you can join PC MagNet by typing GO PCMAG at any CIS prompt.

For any tip we print, you'll receive \$50 plus a *PC Magazine* T-shirt. We regret that we cannot answer letters individually.

Our Advisors

Douglas Belling is a contributing editor and the author of many utilities, including MBOOT.COM and EMS40.SYS.

Frank J. Dierker, Jr., is senior networking editor and the author of the *PC Magazine Guide to Connectivity*.

Alfred Poor is a contributing editor and the author of *New Life for Old PCs*.

Jeff Presson is a contributing editor and the author of *DOS 6 Techniques & Utilities*.

Sal Ricciardi is a contributing editor and the author of the *Running FoxPro* books from Microsoft Press.

Nell Rubenking is technical editor and author of *Can Do DOS*,

Can Do Windows, and *PC Magazine Batch File Lab Notes*.

Joe Salemi is a contributing editor and author of the *PC Magazine Guide to Client/Server Databases*.

Luisa Simone is a contributing editor and the author of the book *Microsoft Publisher*.

Craig Stinson is a contributing editor and coauthor of *Running Windows 3.1* and *Running Microsoft Excel*.

M. David Stone is a contributing editor and coauthor of *Word for Windows Companion*, Second Edition.

Ethan Winer is a contributing editor and the author of *PC Magazine BASIC Techniques and Utilities*.

So what's the answer? For not much more than the cost of an ISA memory card you can get a replacement motherboard with a 486SX CPU. Admittedly, this is far short of the state of the art, but it will run rings around your 386SX/16 system, even with your existing components.—*Alfred Poor*

Monitor Muddle

❷ My monitor's cable is about a foot too short to reach my computer. When I add a 6-foot extension cable, however, the 800-by-600 resolution gets muddy. What's the

reason for this, and is there anything I can do about it?

Shozo Yoshihara
Rexdale, Ontario, Canada

►**PC MAGAZINE:** Your problem sounds like one of signal loss: the voltage of the signal arriving at the monitor is too low. This could be caused by improper termination, but since the monitor works okay without the extension cable, termination is probably not the problem.

The most likely culprit is a low-quality extension cable, so the solution is to get a good quality cable. If you want to go first class, try Extron Electronics (800-633-9876)—but be prepared to spend as much as \$85 for a 10-foot cable. (It's possible to run a graphics signal over hundreds of feet, but you'd need a signal amplifier to do that.)

Signal loss in transmission can be a problem for more than monitors. There are limits to the length of cable that can provide reliable operation for parallel and serial devices—printers for example. For parallel connections, the recommended limit is 10 feet; the limit for serial connections is 50 feet. Although you can often get away with a cheap cable (under \$10) for short distances, you need to spend more for a good quality cable as you near (or pass) these standard limits.

—*Alfred Poor*

■ OPERATING ENVIRONMENTS

Comparing Two Paths in a Batch File

❷ I want to be able to compare two paths in a batch file. The problem is, the line


```
if not %path%==%newpath% ECHO Sorry
    pa!
```

seems to work just fine on the command line, but not when I run it in a batch file. What gives?

Adolfo Barrios
via ZiffNet

► **PC MAGAZINE:** DOS does not support the expansion of environment variables at the command line; it does that only within batch files. When you enter that command at the DOS prompt, DOS performs

a comparison between the literal strings "%path%" and "%newpath%", not between the values of the environment variables named by those strings. Thus this command only *seems* to work at the DOS prompt.

Within a batch file, the two variables do get replaced by their values, and here another problem arises. The strings compared by the IF x==y command must not contain any separators, and to DOS the semicolon is a separator, just like a space or TAB. Since the elements of the path are separated by semicolons, an IF

statement involving the path will cause an error.

To compare two paths, you have to split them into their individual elements and compare those one by one, as the batch file CP.BAT (Figure 1) does. CP.BAT assumes you've already created the environment variable NewPath, and that neither Path nor NewPath exceeds 117 characters. CP.BAT turns the fact that DOS treats the semicolon as a separator into an advantage. It passes the Path to itself on the command line, causing each individual directory to be treated as

```
@ECHO OFF
REM CP.BAT - Compare Path with variable NewPath
REM DO NOT change the name of this batch file!
IF NOT '%1'=='' GOTO Step1
ECHO Path: "%path%"
ECHO NewPath: "%NewPath%"
SET same=Y
SET countA=
CALL CP A %Path%
IF '%same%'=='N' ECHO %countA% NOT SAME %countB%
IF '%same%'=='Y' ECHO %countA% SAME %countB%
ECHO.
FOR %%v IN (countA countB same OneDir) DO SET %%v=
IF '%DEBUG%'=='Y' PAUSE
GOTO End

:StepA
SHIFT
SET OneDir=%1
```

```
SET countA=%countA%x
SET countB=
REM Before "Seek" in next line is a TAB character
IF '%DEBUG%'=='Y' ECHO Position %CountA% Seek "%OneDir%"
CALL CP B %NewPath%
IF '%same%'=='N' GOTO End
IF '%1'=='' GOTO End
GOTO StepA

:StepB
SHIFT
SET countB=%countB%x
IF NOT '%countB%'=='%countA%' GOTO StepB
REM Before "Find" in next line is a TAB character
IF '%DEBUG%'=='Y' ECHO Position %CountB% Find "%1"
IF NOT '%1'=='%OneDir%' SET same=N

:End
```



Figure 1: CP.BAT reports whether the variable NewPath has the same value as the DOS path.

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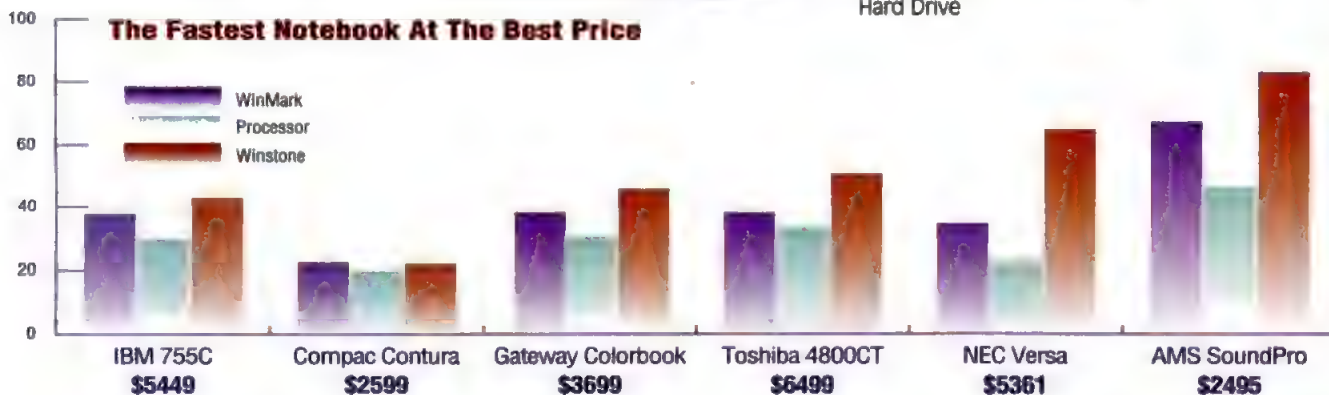
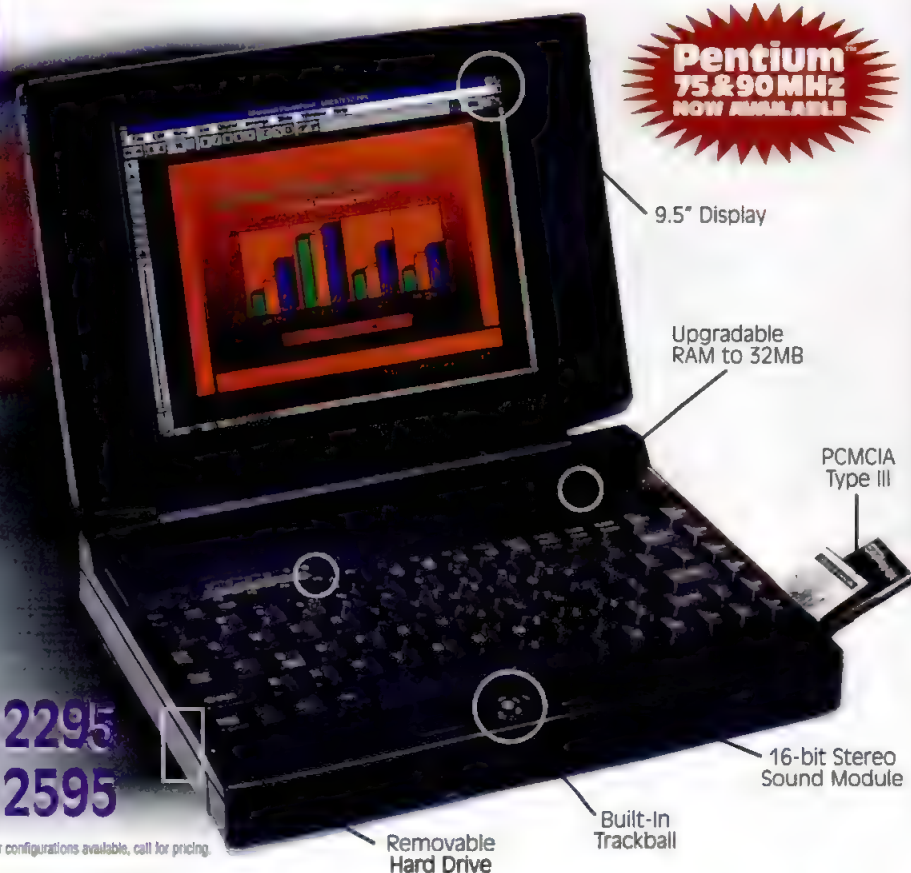
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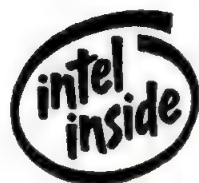
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CIRCLE 235 ON READER SERVICE CARD


```

ECHO OFF
CLS
SET NewPath=
CALL CP.BAT
SET NewPath=%path%
CALL CP.BAT
SET NewPath=%NewPath%;X
CALL CP.BAT
SET NewPath=%path%
PATH %path%;X
CALL CP.BAT
PATH %NewPath%
SET NewPath=

```



Figure 2: TESTCOMP.BAT demonstrates the workings of CP.BAT with four different input strings.

a separate command line parameter. Then it uses the same technique to check whether the same directory is present in the same position in the new path. Only if every directory is present in the same position does CP.BAT report that the two paths are the same.

TESTCOMP.BAT (Figure 2) demonstrates CP.BAT with four different input strings. To get a clearer picture of how CP.BAT works, enter the command SET DEBUG=Y before running TESTCOMP.BAT. This causes CP.BAT to report as it looks for each element of the path.—Neil J. Rubenking

WORD PROCESSING

Building a Function Library in WinWord

❓ I have several WordBasic functions stored in different templates that I want to use in multiple macros. Is there a way to share WordBasic code across many files?

Chip Clofine
via CompuServe

► **PC MAGAZINE:** It is actually quite easy to create a function library. But it's worth discussing functions themselves a bit first, for those who haven't discovered them yet.

Briefly, functions are useful tools for minimizing the need to repeat code. Suppose, for example, you're writing a macro that repeatedly needs to convert inches to centimeters. You could add code throughout the macro to convert to the metric values each time the macro asks you to type in a measurement. Or you can

create a function to handle the conversion, and have the macro call on the function as needed.

You can find details for creating and using functions—along with examples—in the WinWord Help file. Choose Help Contents, then Programming with Microsoft Word (in WinWord 6.x) or Word-Basic Programming Language (in WinWord 2.x), and search for the Function ...End Function statement.

For our purposes, the only important points to note about functions are that when you define functions, you give them names, and that you call on functions by name. If you've created a function called ConvertInches, for example, you would call up the function from elsewhere in the macro with a line that takes the form:

```
Cm = ConvertInches(Inches)
```

This will pass the current value for the variable Inches to the function, and set the variable Cm to match the converted result.

A less than obvious feature about functions is that you can not only call on them from within the same macro, but from other macros as well. And that means that you can easily create a macro library by creating a macro definition (I hesitate to call it a macro) that consists of nothing but function definitions.

To create a macro library, choose Tools | Macro, enter an appropriate name, such as Functions, and choose Create. Then delete the Sub MAIN and End Sub statements and enter your function definitions.

To call on any of the functions in the library from any macro, simply enter the library name before the function name. Using the ConvertInches example, once again, the statement would take the following form:

```
Cm = Functions.ConvertInches(Inches)
```

where Functions is the name of the library. Finally, make sure to store the library in the Normal template, so you can get at it no matter what template is attached to the current document.

—M. David Stone

SPREADSHEETS

Ignoring Blank Cells

✓ **TIP** Your use of database statistical functions to solve David Schreiber's problem (October 25, 1994, page 317) seems like unnecessary work to me. Why not just use Lotus 1-2-3's @CELL function to determine whether a test score is blank? You could set up your worksheet as in Figure 1.

In the "Max Possible Scores" block, put the maximum scores for each test in row 3, directly under the test headings. Then enter conditional formulas in the remainder of that block to show what the maximum possible score was for each student for each test. For example, the formula at G5 would be

```
=IF(@CELL("TYPE",B5)="",0,G$3)
```

You would copy this formula into G5..I7. Column J would then total columns G through I to determine each student's total possible score; the formulas in column K would divide the column E totals by the column J totals to get a final percentage score for each student.

Besides being simpler than your proposed database function solution, this approach

	A	B	C	D	E	F	G	H	I	J	K
		Actual Scores				Max Possible Scores					
		Test1	Test2	Test3	Total	Test1	Test2	Test3	Total	Percent	
1						10	5	20	35		
2											
3											
4											
5	Chuck		3	14	17	0	5	20	25	68%	
6	Diana	4	4	18	26	10	5	20	35	74%	
7	Elizabeth	6	3	15	24	10	5	20	35	74%	

Figure 3: Used together with @CELL formulas that test for a blank value in the "Actual Scores" section, this worksheet setup lets you ignore blank values.

proach lets you maintain the more natural worksheet layout, with student names as row headings and test numbers as column headings.

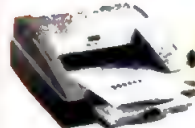
Paul D. Kuijper
Heemstede, The Netherlands

► **PC MAGAZINE:** Mr. Kuijper is absolutely right. The @CELL function will do just fine in this situation, without making you stand on your head or turn your worksheet on its side! Moreover, if you want a label as well as a blank in the "Actual Scores" section to result in a 0 in the "Max Possible Scores" section, add a second

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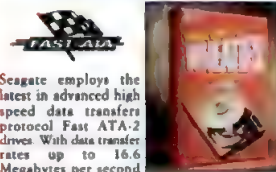
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@CELL function to the @IF formula.

To do this the formula in G5 would be

```
=IF(@CELL("TYPE",B5)="B"#OR#
```

```
@CELL("TYPE",B5)="L",0,G$3)
```

This lets you type explanatory text such as "sick" or "submitted paper in lieu of exam" into cell B5 instead of simply leaving the cell blank.—*Craig Stinson*

■ GRAPHICS

Crazy Colors in

.CGM Files

❓ I am trying to work with .CGM files created on a Sun SPARC II. I use FTP (binary mode) to transfer the files from the workstation to my PC. Neither CorelDraw 3.0 nor Word for Windows 2.0c will read these files directly, so I use Hijaak 2.1 to translate the .CGM files into another format.

Here's the problem: The translated files always contain different colors than the originals. I've tried many different formats, including .BMP, .DRW, .DXF, .WMF—and even back to .CGM—all to no avail. Not only are the colors different than in the original image, but they are different from each other. In fact, CorelDraw and Word have even printed different colors from the same converted .CGM file.

I've also noticed that the file size changes dramatically each time Hijaak performs a conversion, but I don't know if the file size change is responsible for the color shift. Here's a list of the different conversions and filesizes.

Original .CGM 199K

Converted .BMP 1.33MB

Converted .CGM 363K

Converted .DRW 783K

Converted .DXF 1.749MB

Converted .WMF 320K

Why is this happening? And more importantly, how can I retain the colors from the original .CGM file?

*Steve N. Stephens
Missouri City, Texas*

► **PC MAGAZINE:** The Hijaak conversion program is both the source of your problem and the solution.

.CGM files can notate color in one of

two ways—by storing direct RGB values or by using an intermediate 16-color palette. When Hijaak converts a .CGM file to another format, it prefers the color information to be notated in a direct RGB format. Direct RGB values always yield the most consistent color results.

If, as is very likely the case, your source .CGM file contains a palette, Hijaak can't access the color information directly. So instead Hijaak attempts to identify the specific variation (known as a flavor) of the .CGM file, because certain .CGM flavors are associated with specific palettes. For example, Hijaak knows the exact color values in the palette of a Harvard Graphics .CGM file. When converting from a Harvard Graphics .CGM file to another format, Hijaak simply plugs in the correct color information.

Whenever Hijaak does not have information about the palette in the source .CGM file, it uses a default palette for the target file. For example, if you translate from an unknown flavor of .CGM to .BMP or .WMF format, Hijaak uses the default Windows VGA palette. Alternatively, if you translate from an unknown flavor of .CGM to the .DXF format, Hijaak uses the fixed 256-color AutoCAD palette. Remember that Hijaak chooses a default palette based on the target file format, which explains why the colors are different in a .BMP file than in a .DXF file.

You're home free if the graphics program you are using on the Sun SPARC II allows you to create a .CGM file with direct RGB values (rather than a fixed palette). If not, you must upgrade to Hijaak Pro for Windows. The upgrade price from Inset Systems (203-775-5866) is only \$49 for the disk version or \$59 for the CD version. Hijaak Pro allows you to assign specific RGB values to the color slots in a palette during the translation process. This technique is known as *palette remapping*; in effect, it allows you to create a custom palette that Hijaak will save and reuse whenever you translate from your particular .CGM flavor to another file format.

By the way, the Hijaak technical support staff is always on the lookout for new flavors of standard formats like .CGM. They will analyze any file that Hijaak can't translate properly—free of charge.

The color differences you are experi-

encing at print time are not related to Hijaak's translation process and require a different solution. First you must understand that at print time a software program can either convert the RGB (red, green, blue) values in a picture to the CMYK (cyan, magenta, yellow, black) equivalents needed by the printer, or it can dump the RGB data to the Microsoft printer driver and let the colors fall where they may. CorelDraw—as a dedicated graphics program—handles the RGB-to-CMYK conversion internally, while Microsoft Word relies on the Windows printer driver. If you absolutely need color consistency between the two applications, use CorelDraw to save the image in a file format that supports CMYK values, like Encapsulated PostScript or TIFF 6.0. But be warned, EPS files will print properly only if you have a PostScript-compatible printer. Likewise, converting an RGB .TIF picture to CMYK can significantly increase the file size and the amount of time it takes to process and print the image.

On a final note: The file size changes you experience when you translate between different formats are a separate phenomenon and have no bearing on the color shift. In general, you'll find that file size increases whenever you convert a vector format, such as .CGM, to a raster format, such as .BMP. The efficient drawing instructions and geometric shapes of an object-oriented vector file must be translated into a series of less efficient dots. Even when converting between vector formats, file size can change significantly owing to the different capabilities of each format. For example, a binary .CGM file will become much larger when converted to the .DXF format because Hijaak supports only the ASCII encoded version of .DXF—and ASCII code always produces larger files. Similarly, if your source .CGM file contains solid shapes with complex outlines, Hijaak must simulate the original single object with a series of smaller objects, because .DXF files can not contain filled polygons with more than four sides. As the number of objects in a vector file increases, so does file size. I suggest that you turn to the Hijaak manual for more information on each file format's advantages and limitations.

—*Luisa Simone*

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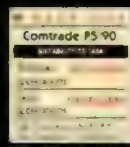
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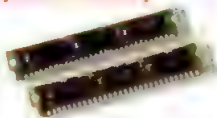
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Nikon Cool Scan LS-100 PC int./ext.	1629.1849
Nikon ScanSnap AX-1200 flatbed	1099
Polaroid Sprint Scan 35	1999
Reyes 2412 PC w/PhotoShop	749
Umax w/fax 56 w/PhotoShop II OmniPage	759
Umax UC630 w/PhotoShop II OmniPage	599
Umax UC630 w/PhotoShop II OmniPage	979

VIDEO BOARDS

ATI Graphics Wonder Mach32 1M SAvLB	119
ATI Graphics Ultra 2M SAvLB	199
ATI Graphics XPression 2M VLB/PC	209
ATI Graphics Ultra 2M VLB/PCISA	269
ATI Graphics Ultra 2M VLB/PCISA	289
ATI Graphics Turbo 2M SAvLB/PC	369
ATI Graphics Turbo 2M SAvLB/PC	599
Diamond Speedstar Pro ISA 1M VLB 1M 95109	759
Diamond Speedstar 64 PC or ISA 1M 2M 149.199	119
Diamond Stealth 64 VRAM 1M/2M	154.199
Diamond Stealth 64 VRAM 2M VLB/PC	319
Diamond Stealth 64 VRAM 4M VLB/PC	469
Diamond Viper SE VLB or PCI 2M 4M	319.475
Hercules Dynamite Pro ISA or VLB 1M	149
Metro MGA Ultra 2M ISA/VESA	489
Metro MGA IMPV 34 VLB/ISA	689
Matrox Mini GXE VLB Level 11/12	349.419
Matrox Mini GXE 64 1M PCI 2M VLB	179.249

TAPE BACKUP

Colorado Jumbo 250/350 100	152.169.915
Colorado Tracker 250/350 100	289.319.475
Colorado Tape Master int. 1G2G3G	629.979.1179
Conner Tape Drives	BEST PRICES
Mountain Tape Drives	BEST PRICES

NETWORKING

3COM 3C503B Etherlink II 16 bit coax/10BT	195
3COM 3C503B Etherlink II coax	110
3COM 3C503B Etherlink II coax (5-pin)	485
3COM 3C503B Etherlink II 10BT 15-pin	449
3COM 3C503B Etherlink II coax 8 BT	125
3COM 3C503B Etherlink II EISA 10BT	225
3COM 3C589PT Etherlink II PCMCIA 10BT	185
3COM 3C589C Etherlink II PCMCIA 10BT	227
3COM 3C182T 12-Port Link Builder 10BT	294
3COM 3C182T 12-Port Link Builder 10BT	585
3COM 3C182T 12-Port Link Builder 10BT	189
3COM 3C182T 12-Port Link Builder 10BT	78
3COM 3C182T 12-Port Link Builder 10BT	229
3COM 3C182T 12-Port Link Builder 10BT	89
3COM 3C182T 12-Port Link Builder 10BT	99
3COM 3C182T 12-Port Link Builder 10BT	111
3COM 3C182T 12-Port Link Builder 10BT	229
3COM 3C182T 12-Port Link Builder 10BT	159

SOUND BOARDS

MediaVision FX08	545
MediaVision FX08	689
MediaVision FX08	275
MediaVision FX08	235
MediaVision FX08	312
MediaVision FX08	415
MediaVision FX08	525
MediaVision FX08	179.599
MediaVision FX08	345
MediaVision FX08	409
MediaVision FX08	329
MediaVision FX08	379
MediaVision FX08	122
MediaVision FX08	139
MediaVision FX08	159
MediaVision FX08	259
MediaVision FX08	264
MediaVision FX08	139
MediaVision FX08	169
MediaVision FX08	197
MediaVision FX08	179
MediaVision FX08	365
MediaVision FX08	242
MediaVision FX08	329
MediaVision FX08	124
MediaVision FX08	239

VIDEO CAPTURE

ATI Tech WaveMaster TV	319
ATI Tech WaveMaster TV	299
ATI Tech WaveMaster TV	335
ATI Tech WaveMaster TV	759
ATI Tech WaveMaster TV	1569
ATI Tech WaveMaster TV	369
ATI Tech WaveMaster TV	415
ATI Tech WaveMaster TV	525
ATI Tech WaveMaster TV	179.599
ATI Tech WaveMaster TV	345
ATI Tech WaveMaster TV	409
ATI Tech WaveMaster TV	329
ATI Tech WaveMaster TV	379
ATI Tech WaveMaster TV	122
ATI Tech WaveMaster TV	139
ATI Tech WaveMaster TV	159
ATI Tech WaveMaster TV	259
ATI Tech WaveMaster TV	264
ATI Tech WaveMaster TV	139
ATI Tech WaveMaster TV	169
ATI Tech WaveMaster TV	197
ATI Tech WaveMaster TV	179
ATI Tech WaveMaster TV	365
ATI Tech WaveMaster TV	242
ATI Tech WaveMaster TV	329
ATI Tech WaveMaster TV	124
ATI Tech WaveMaster TV	239

CD-ROM KITS

ATI Tech WaveMaster TV	319
ATI Tech WaveMaster TV	299
ATI Tech WaveMaster TV	335
ATI Tech WaveMaster TV	759
ATI Tech WaveMaster TV	1569
ATI Tech WaveMaster TV	369
ATI Tech WaveMaster TV	415
ATI Tech WaveMaster TV	525
ATI Tech WaveMaster TV	179.599
ATI Tech WaveMaster TV	345
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ATI Tech WaveMaster TV	329
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ATI Tech WaveMaster TV	259
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ATI Tech WaveMaster TV	169
ATI Tech WaveMaster TV	197
ATI Tech WaveMaster TV	179
ATI Tech WaveMaster TV	365
ATI Tech WaveMaster TV	242
ATI Tech WaveMaster TV	329
ATI Tech WaveMaster TV	124
ATI Tech WaveMaster TV	239

SPECIALS

Pacific Data Direct Net 10-BT ENET	279
Pacific Data Direct Net EX	449
SMC Arcnet PC130 PC270E	88.108
SMC Arcnet PC650 w/interfacer	120.188
SMC Arcnet 8-port coax Active Hub	225
SMC Ethercard - Elite 16 bit coax or 10BT	115
SMC Ethercard - Elite 16 bit coax or 10BT	134
SMC Ethercard - Elite 32 bit EISA 10BT	579
SMC Elite 16 Ultra Ethernet coax or 10BT	97
SMC Ethernet 10BT Coaxnet 8x128	289.599
SMC Ethernet High Speed	CALL
Thomas Conrad 6245 Arcnet 16-bit	176
Thomas Conrad 3045 STP 8-port Hub	400
Thomas Conrad 3045-EX 100Mbps fiber	740
Thomas Conrad 3045ST 100Mbps fiber	604
Thomas Conrad 3045 ST 8-port Hub	158
Xicom ProNet Ethernet 10baseT or coax	259
Xicom ProNet Ethernet 10baseT or coax	455
Xicom ProNet Ethernet 10baseT or coax	289
Xicom ProNet Ethernet 10baseT or coax	379
Xicom ProNet Ethernet 10baseT or coax	199
Xicom ProNet Ethernet 10baseT or coax	249

QMS 1060	2399
QMS 1660	3899
QMS Colorscript 210	3199
QMS Colorscript 230	6995

SEIKO

Small Label Printer - Printer Pro	148.200
Small Label Printer - Printer Pro	2420

TEXAS INSTRUMENTS

MicroMart m960 Color	339
MicroMart m960 Color	619.99
MicroMart m960 Color	1179.1519
MicroMart m960 Color	1349
MicroMart m960 Color	1599

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Processor	Display	Hard Drive	Price
486DX2/40	9.5" Dual Scan	170MB	\$2739
486DX2/40	8.4" Active	170MB	\$3219
486DX2/40	8.4" Active	340MB	\$3689
486DX2/50	9.5" Active	340MB	\$4539
486DX4/75	9.5" Active	340MB	\$5099
486DX4/75	9.5" Active	510MB	\$5479

Business Lease: \$101/mo.

ProLinea Desktops

- ▲ 4MB RAM expandable to 100MB
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- ▲ Local bus graphics
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- ▲ Energy Star compliant
- ▲ MS DOS 6.0, Windows 3.1

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Processor	RAM	Hard Drive	Price
486SX 33	4MB	270MB	\$1059
486SX2/50	4MB	270MB	\$1169
486DX2/50	4MB	420MB	\$1379
486DX2/66	4MB	420MB	\$1499
486DX2/66	4MB	525MB	\$1639
486DX4/100	8MB	420MB	\$1999

*COMPAQ color monitors start at \$239.99

Monitors sold separately

Contura 400

- ▲ 486DX2/40 processor
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- ▲ 2 Type II or 1 Type III PCMCIA slots
- ▲ Large built-in trackball
- ▲ MS-DOS, Windows 3.1, Tabworks, Lotus Organizer

Display	Hard Drive	Price
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- ▲ 1-Year Warranty

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- ▲ Sharp, 600dpi print quality
- ▲ 2MB RAM w/Memory Enhancement Technology
- ▲ 1-Year Warranty

HP LaserJet 4P \$959.99

HP DeskJet/DeskWriter 540

- ▲ Sharp, 600 x 300dpi "laser-like" print quality with RET (black)
- ▲ 15% faster color printing with 512KB RAM
- ▲ 3-Year Warranty

HP DeskJet 540 \$289.99

HP DeskWriter 540 \$289.99

HP DeskJet/DeskWriter 320

- ▲ High-quality 3 PPM printing
- ▲ 600x300dpi with RET (black)
- ▲ 1-Year Warranty

HP DeskJet 320 \$299.99

HP DeskWriter 320 \$299.99

HP DeskWriter 320 with sheet feeder \$359.99

HP DeskJet 1200C

- ▲ Sharp, 600x300dpi "laser-like" print-quality with ColorSmart
- ▲ 2MB memory expandable to 26MB
- ▲ 180-sheet paper tray
- ▲ 1-Year Warranty

HP DeskJet 1200C \$999.99

HP DeskJet 1200C/PS \$1589.99

HP DeskJet/DeskWriter 560C

- ▲ 600 x 300 dpi "laser-like" print quality (black, 300dpi color)
- ▲ Resolution Enhancement Technology for smooth, crisp text and graphics
- ▲ 3-Year Warranty

HP DeskJet 560C \$479.99

HP DeskWriter 560C \$479.99



HP DeskJet 320
Shown with sheet feeder
and color kit option.



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Texas Instruments

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TravelMate 4000M

- ▲ Brilliant color display
- ▲ 16-bit sound card
- ▲ Integrated Pointing device
- ▲ 2 Type II or 1 Type III PCMCIA slot

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Processor	Screen	Hard Drive	Price
486SX2/50	9.5" Dual Scan	200MB	\$2369
486SX2/50	8.4" Active	340MB	\$3099
486DX2/50	9.5" Dual Scan	340MB	\$2549
486DX2/50	8.4" Active	455MB	\$3219
486DX4/75	9.5" Dual Scan	455MB	\$3399
486DX4/75	8.4" Active	340MB	\$4099
486DX4/75	8.4" Active	455MB	\$4249
486DX4/100	9.5" Active	525MB	\$5549

Business Lease: \$69/mo.



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- ▲ Loads of FREE software
- ▲ 2 Type II or 1 Type III PCMCIA slot
- ▲ 3-Year warranty



Ascentia 900N

- ▲ 4MB/8MB RAM exp. to 32MB
- ▲ Removable hard drive
- ▲ 2 Type II or 1 Type III PCMCIA slot

Model	Screen	Hard Drive	Price
4/50 Model 343W	10.3" Dual Scan	340MB	\$2719
4/50 Model 343W	9.5" Active	340MB	\$3629
4/75 Model 343W	10.3" Dual Scan	340MB	\$3219
4/75 Model 513W	10.4" Active	510MB	\$5029

Business Lease: \$100/mo.



Ascentia 900N

AST Advantage! Adventure Multimedia

- ▲ Available in All-In-One, Desktop, or Minitor models
- ▲ Double speed IDE CD-ROM drive
- ▲ 16-Bit Creative Labs Soundblaster
- ▲ 14.4 Send/Receive Fax modem w/telephone answering
- ▲ Over 17 software titles
- ▲ 3-Year Warranty

Processor	Hard Drive	Price*
486DX2/66 All-In-One	420MB	\$1499+
486DX2/66 Desktop	420MB	\$1589
Pentium 60MHz Desktop	540MB	\$1999

Business Lease: \$55/mo.

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Versa M and Versa P

- ▲ 2 Type II or 1 Type III PCMCIA slots
- ▲ Removable hard drive and floppy drive
- ▲ Removable screen
- ▲ Integrated speaker, microphone
- ▲ MS-DOS, Windows 3.1, Windows Sound System, Video for Windows Run Time

Processor	Hard Drive	Screen	Price
486DX4/75	340MB	Dual Scan	\$3589
486DX4/75	540MB	Active	\$4729
486DX4/75	540MB	High Res.	\$5099
486DX4/100	810MB	Active	\$5569
Pentium 75	540MB	Active	\$5389
Pentium 75	810MB	Active	\$5899

Business Lease: \$118/mo.



Versa M

Versa V

- ▲ 4MB expandable to 20MB
- ▲ 2 Type II PCMCIA slots or 1 Type III
- ▲ Removable hard drive
- ▲ Removable floppy - add second battery
- ▲ MS-DOS 6.21, Windows 3.1, built-in trackball

Processor	Screen	Hard Drive	Price
486DX2/50	9.5" Dual Scan	250MB	\$2499
486DX2/50	9.5" Dual Scan	340MB	\$2669
486DX2/50	9.5" Active	250MB	\$3249
486DX2/50	9.5" Active	340MB	\$3399
486DX2/50	9.5" Active	540MB	\$3779
486DX4/75	9.5" Active	340MB	\$3879
486DX4/75	9.5" Active	540MB	\$4249

Business Lease \$92/mo.



Versa V

Ready Multimedia Desktops

- ▲ NEC CD-ROM drive
- ▲ SoundBlaster 16 sound card
- ▲ Speakers, headphones
- ▲ Fax modem
- ▲ MS-DOS, Windows, Quicken and more
- ▲ CD titles: Compton's Encyclopedia, PFS Window Works

Processor	Hard Drive	Price
486SX/33 Desktop	270MB	\$1299
486DX2/66 Desktop	340MB	\$1479
486DX2/66 Minitor	420MB	\$1539
P60 Minitor	420MB	\$1899

Business Lease: \$50/mo.
Monitors sold separately.



Ready Multimedia

Versa S

- ▲ Upgradable hard drive
- ▲ SurePoint integrated pointing device
- ▲ 2 Type II PCMCIA slots or 1 Type III
- ▲ Only 4.5 lbs.

Processor	Screen	Hard Drive	Price
486SX/33	9.5" Mono	210MB	\$1229
486SX/33	9.5" Dual Scan	210MB	\$1429
486SX/33	9.5" Active	210MB	\$2179
486DX2/50	9.5" Active	260MB	\$2369
486DX2/50	9.5" Active	350MB	\$2549

Business Lease: \$50/mo.

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- ▲ Accupoint integrated pointing device
- ▲ MS-DOS 6.21, Windows for Workgroups 3.11, Windows Sound System 2.0, Indeo Video, and Run Time Video for Windows

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Pentium**



10.4" Active Matrix Color Display

T4900

Satellite Notebooks

- ▲ 4MB RAM expandable to 20MB
- ▲ 1 Type III (T1900s), 1 Type II and 1 Type III (T2400) PCMCIA slot
- ▲ 82-key keyboard
- ▲ MS-DOS, Windows 3.1
- ▲ Ballpoint mouse with Quickport (T1900s)
- ▲ Accupoint pointing device (T2400)
- ▲ Enhanced power management

Model	Processor	Screen	Hard Drive	Price
T1910	486SX/33	9.5" Mono	200MB	\$1319
T1910	486SX/33	9.5" Dual Scan	200MB	\$1779
T1960	486DX2/50	9.5" Dual Scan	200MB	\$2159
T1960	486DX2/50	9.5" Dual Scan	320MB	\$2329
T1960	486DX2/50	8.4" Active	200MB	\$2749
T1960	486DX2/50	8.4" Active	320MB	\$2919
T2400	486DX2/50	9.5" Dual Scan	250MB	\$2749
T2400	486DX2/50	9.5" Dual Scan	320MB	\$2879
T2400	486DX2/50	8.4" Active	250MB	\$3299
T2400	486DX2/50	8.4" Active	320MB	\$3419

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- ▲ Integrated AccuPoint pointing device

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Processor	Screen	Hard Drive	Price
486SX/33	7.8" Active	250MB	\$2219
486DX2/50	8.4" Active	250MB	\$3469

Business Lease: \$81/mo.

T4700, T4800 and T4850

- ▲ Brilliant color display with local bus video
- ▲ 2 PCMCIA slots (Type II, Type III)
- ▲ Microsoft Sound System, built-in microphone, audio out port
- ▲ MS-DOS, UltraFont, Indeo video compression software, Windows for Workgroups 3.11 and Run Time for Windows

Model	Processor	Screen	Hard Drive	Price
T4700	486DX2/50	9.5" Active	200MB	\$3279
T4700	486DX2/50	9.5" Active	320MB	\$3499
T4800	486DX4/75	9.5" Active	500MB	\$4799
T4850	486DX4/75	10.4" Active	500MB	\$5199
T4850	486DX4/75	10.4" Active	772MB	\$5569

Business Lease: \$113/mo.

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\$3279



T4700

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\$449.99

Model	Description	Price
XJ1144	14.4/14.4 XJACK	\$209.99
CC3144	14.4/14.4 PCMCIA	\$209.99
XJ2144	14.4/14.4 XJACK GOLD	\$249.99
CC4144	14.4/14.4 PCMCIA GOLD	\$249.99

Motorola PCMCIA 14.4 cellular modems

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Artisoft Networking Products

LANTastic V6.0 1 User	\$79.99
LANTastic V6.0 5 User	\$329.99
LANTastic 10Base2 Starter Kit	\$229.99
LANTastic 10BaseT Starter Kit	\$419.99
LANTastic Notebook Starter Kit	
10Base2	\$639.99
LANTastic Notebook Starter Kit	
10BaseT	\$759.99

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- ▲ Built-in sound, speaker, microphone
- ▲ Built-in 14.4 data/fax modem
- ▲ Infrared ports for wireless data transfer
- ▲ Built in telephone answering machine & speaker phone
- ▲ 2 PCMCIA Type II slots
- ▲ Over 15 popular software titles included!

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ThinkPad 755CD

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ThinkPad® 360 and 360E

- ▲ 4MB RAM exp. to 20MB
- ▲ Modular design, removable hard drive & floppy drive
- ▲ Local Bus Graphics with 1MB video RAM
- ▲ 2 Type II or 1 Type III PCMCIA slot
- ▲ TrackPoint II integrated pointing device
- ▲ IBM DOS 6.3, Windows 3.1, Lotus cc:Mail, Organizer, ScreenCam, Official Airline Guide FlightDisk, CoSessions Host, Prodigy, America Online, and FaxWorks 3.0
- ▲ Port Replicator and Docking Station available

Processor	Screen	Hard Drive
486SL/33	9.5" Mono	340MB
486SL/33	9.5" Dual Scan	170MB
486SL/33	9.5" Dual Scan	340MB
486SL/33	8.4" Active	170MB
486SL/33	8.4" Active	340MB
486DX2/50	9.5" Dual Scan	340MB
486DX2/50	9.5" Dual Scan	540MB
486DX2/50	8.4" Active	340MB
486DX2/50	8.4" Active	540MB

ThinkPad® 510 Subnotebook

- ▲ IBM 486BL2/50 processor
- ▲ 4MB RAM exp. to 20MB
- ▲ 200MB hard drive
- ▲ 7.7" color display
- ▲ Type II PCMCIA slot
- ▲ TrackPoint II integrated pointing device
- ▲ 3.5" external floppy drive
- ▲ Weighs only 4.0 lbs.
- ▲ IBM DOS 6.3, Windows 3.1, Lotus cc:Mail, Organizer, ScreenCam, Official Airline Guide FlightDisk, CoSessions Host, Prodigy, America Online, and FaxWorks 3.0



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Processor	RAM	Screen	Hard Drive	Price
486DX2/50	4MB	9.5" Mono	200MB	\$1699
486DX2/50	4MB	9.5" Dual Scan	200MB	\$2129
486DX2/50	8MB	9.5" Dual Scan	340MB	\$2549
486DX2/50	4MB	9.5" Active	340MB	\$3069

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Modular architecture for a multitude of user-upgradable features

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- ▲ 32-bit VL local bus video
- ▲ Detachable video display
- ▲ Built-in 16-bit stereo sound with speaker and microphone
- ▲ Integrated trackball
- ▲ Two Type II or one Type III PCMCIA slot
- ▲ MS-DOS, Windows for Workgroups, Microsoft Sound System
- ▲ 3-Year Warranty

Processor	RAM	Screen	Hard Drive	Price
486SX/33	4MB	10.4" Mono	200MB	\$2289
486DX2/50	4MB	10.3" Dual Scan	200MB	\$2759
486DX2/50	4MB	10.3" Dual Scan	340MB	\$2969
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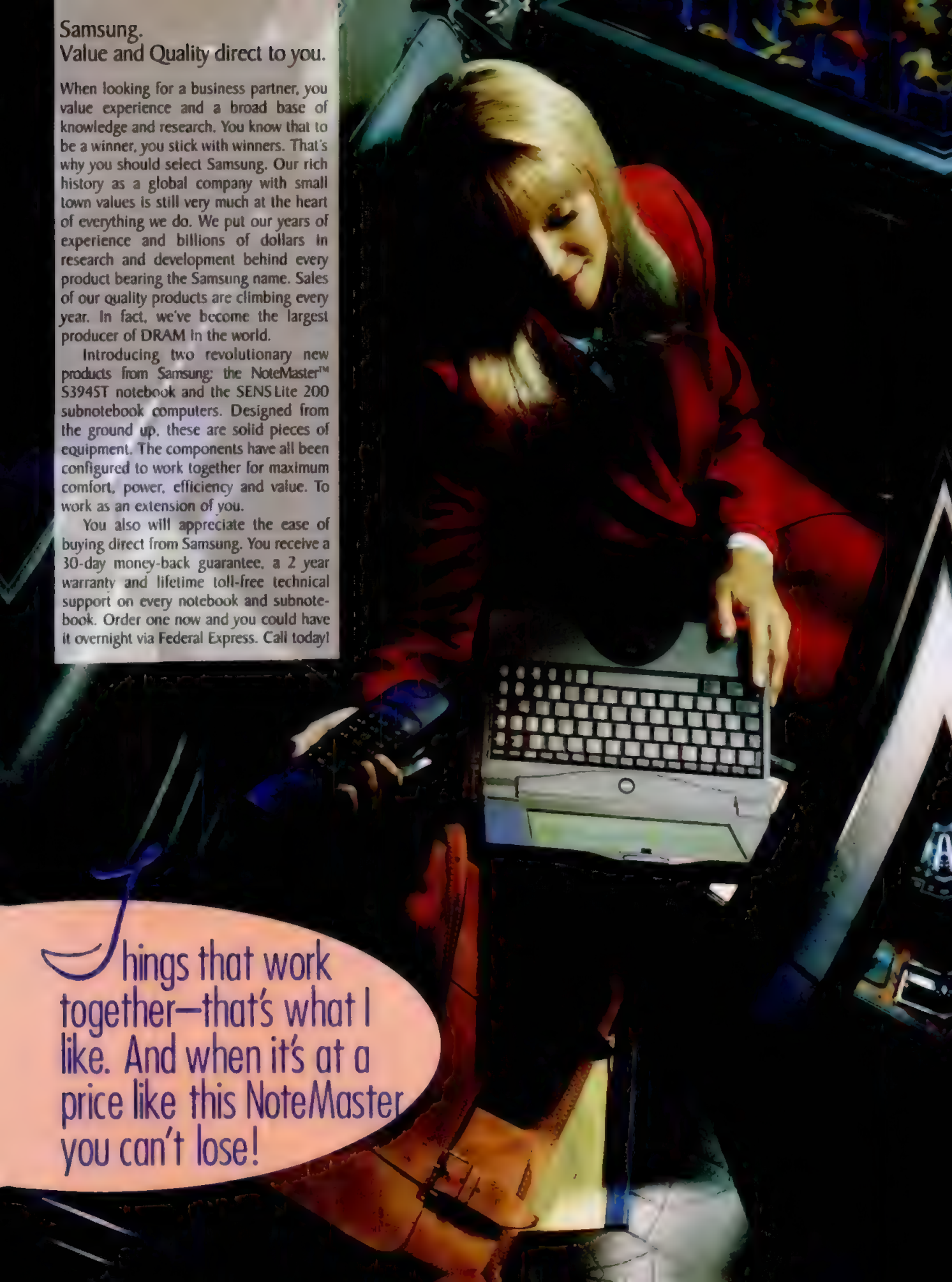
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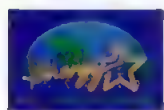
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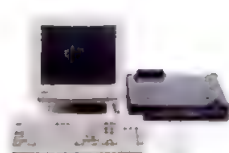
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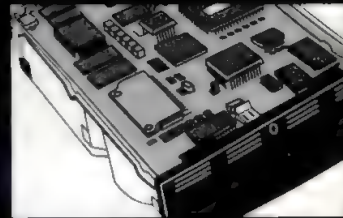
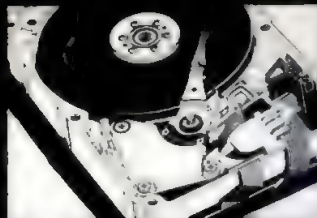
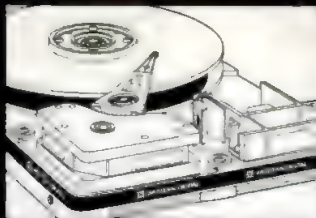
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IDE			
270MB	14ms	MV270A	\$169
365MB	11ms	LT340A	\$188
540MB	14ms	MV540A	\$225
541MB	11ms	LT540A	\$235
731MB	11ms	LT730A	\$275
SCSI			
365MB	11ms	LT365S	\$189
540MB	14ms	MV540S	\$242
541MB	11ms	LT540S	\$245
731MB	11ms	LT730S	\$295
1080MB	10ms	IMP1080	\$525
2160MB	9.5ms	IMP2160S	\$899
4280MB	8.6ms	GP4280S	\$2099

SYQUEST

SCSI	Drive	PC Kit	Mac Kit
44/88MB	SQ5110C	\$249	\$379
105MB	SQ3105S	\$229	\$349
200MB	SQ5200C	\$389	\$549
270MB	SQ3270S	\$369	\$519
IDE		Drive	PC Kit
105MB	SQ3105A	\$179	\$269
270MB	SQ3270A	\$339	\$439

Genuine Syquest Cartridges
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270MB \$65/62/59	

NOTEBOOK UPGRADES

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256MB 17ms	Quantum	\$269
514MB 17ms	Quantum	\$429
NEW! Perce 1.25Gig portable tape back up, weighs less than 10oz, battery powered \$649		
Adaptec PCMCIA to SCSI / Parallel to SCSI \$219 / \$135		
PCMCIA internal docking bay for desktop \$119		

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Drive Media! WIDE SCSI, Optical, Macintosh & Power PC Drives, Hard Disk Cards, PCMCIA, 2 1/2" Drives, Floppy Drives, IBM PS/1, PS/2, and Tandy Drives

CD ROM DRIVES

SCSI				
Foshiba	XM3501	4X	155ms	\$299
Plexstor	PX43CS	4X	170ms	\$339
NEC	CDRS10	3X	195ms	\$269
Sanyo	SH93R	2X	280ms	\$149
IDE (ATAPI)				
Mitsumi	CRMCFX400	4X	230ms	\$225

MULTIMEDIA KITS

SCSI Drive, sound card (in retail pkg)				
PREM=Media Vision Premium 3D PRO=Media Vision Pro 3D				
SB=Sound Blaster 16 SCSI	SA=Sound Blaster SCSI ASP			
	PREM	PRO	SB	SA
SH93R	\$279	\$409	\$309	\$339
CDRS10	\$429	\$569	\$459	\$499
XM3501	\$469	\$609	\$499	\$529
PX43CS	\$499	\$629	\$529	\$559

CD ROM TOWERS

Multiple drives in a single enclosure.				
	2 Drive	4 Drive	7 Drive	
Sanyo 93R	\$359	\$779	\$1289	
NEC 3X	\$669	\$1399	\$2369	
Toshiba 3501	\$755	\$1579	\$2679	
Plexstor 4X CS	\$819	\$1689	\$2879	

SCSI TAPE DRIVES

HOT DRIVE! Conner 4Gig SCSI Mini-Cart Tape Drive! Back-up speed 54MB/min. Kit with drive, Dos/Win software, 1 tape \$539 Requires SCSI controller. Future Domain TMC1610MCD only \$79

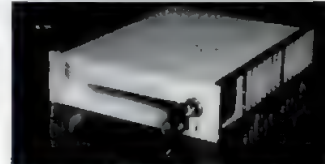
Kit includes 16bit card, DOS or Windows software & 1 tape.			
525MB	Conner	C2525	\$479
2Gig	Conner	4320	\$779
2Gig	HP	35470	\$859
4-8Gig	Conner	4324	\$849
4-8Gig	HP	35480	\$869
4-10Gig	Conner	4326	\$959
4-10Gig	HP	CE1533A	\$1049

Backup Software
Novell NLM 50 user / unlimited / OS/2 \$199 / \$399
NovaStor OS/2 / Macintosh \$89 / \$99
Retrospect for Mac (w/ drive only) \$129
Desktop Mounts 4mm Tape on Mac Desktop \$275

CONTROLLER CARDS

	Alone	w/Drive
ADAPTEC A1522BASIC 16Bit SCSI	\$129	\$109
A1542CBASIC 16Bit SCSI	\$225	\$215
A2742 EISA SCSI	\$379	\$369
A2842 VESA SCSI	\$259	\$249
A2940KIT PCI SCSI	\$299	\$289
Future Domain 1680 16Bit SCSI	\$134	\$119
QLOGIC PCI SCSI & WIDE	\$325	\$315
TEKRAM CACHING CARDS		
DC600CF 16Bit IDE	\$89	\$79
DC680C 32Bit Local Bus IDE	\$109	\$99
DC690C 32Bit PCI IDE	\$149	\$139
SCSI Controllers include COREL SCSI		
DC800B 16Bit SCSI	\$199	\$189
DC880B 32Bit Local Bus SCSI	\$299	\$289
TEKRAM NON-CACHING		
DC300B 16Bit SCSI w/ Corel	\$159	\$149
DC380B VESA SCSI w/ Corel	\$179	\$169
DC290N PCI Enhanced IDE	\$45	\$39
DC200S 16Bit IDE w/ High Speed IO	\$55	\$45
GSI 16Bit IDE accelerators (enhanced IDE)		
Boost Performance 30 to 80% VESA coming soon.		
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1533-32 2IDE, 4 Floppy, IO	\$125	\$115
4C 16Bit supports 8 IDE	\$139	\$129

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ARTISOFT

NodeRunner 2000A	215.58
NodeRunner 2000T	189.05
NodeRunner 2000	169.05
NodeRunner/ST 2000A	169.05
NodeRunner/ST 2000T	73.62
NodeRunner/ST 2000C	73.62
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EtherCard+ Elite coax 5pk	628.55
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3612 Ethernet 12 port hub 10BT	310.99
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3C509B Ethernet III 10BT	111.14
3C509B Ethernet III 10BT 5pk	442.36
3C509B Ethernet III combo	123.77
3C509B Ethernet III combo 5pk	526.78
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3C1827 12 port Linkbuilder 10BT	609.94

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IBM

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intel

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Wyse 55 amber/green/white	223.21
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Multiprotocol print server 10BT HP MIO	247.75
Multiprotocol print server 10BT packet	287.30
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SNAP starter kit-2 computers, 1 printer	119.10
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Jumbo 700 internal	369.74
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Plextor 4plex quad internal	422.72
Sigma Designs RealMagic Lite	289.93
Sigma Designs RealMagic	379.89
Sigma Designs RealMagic CD Kit	659.22
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Sony CDU-55S SCSI 2X internal	199.50
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Sony Moon Star CD 2X kit internal w/sound	214.93
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IX 3010 scanner	399.13

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ES-1200-ProFC	1237.36

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Summagraphics III 12 x 12 16 button	263.90
Summagraphics III 18 x 12 4 button	524.44

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Mag Innovation MX15F	457.44
Mag Innovation DX17F	630.73
Mag Innovation MX17F	799.45
Mag Innovation MX21F	1086.52
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Magnavox CH2099 14" 28 Hi	258.80
Magnavox CM2015 15" 1024	298.89
Magnavox CM4015 15" 1280	358.85
Magnavox CM4017 17" 31	528.85
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Magnavox 20CM404 20"	999.00
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NEC XE17 17"	999.43
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NEC XP15 15"	659.49
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Sony 17SE 17"	969.68
Sony 20SE 20"	1895.00

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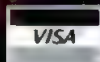
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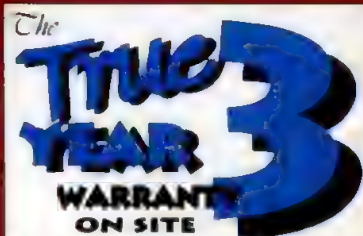
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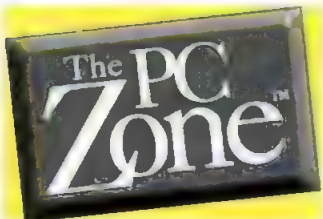


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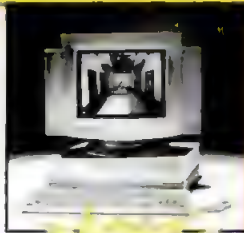
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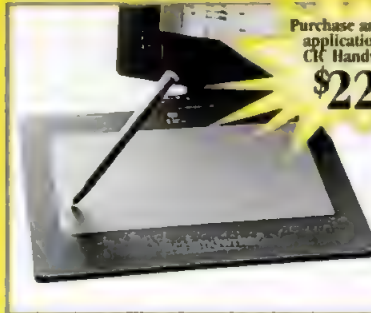
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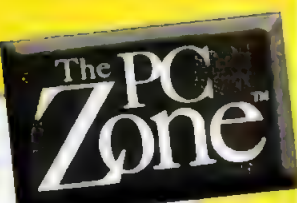


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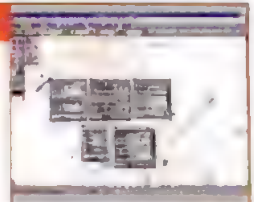
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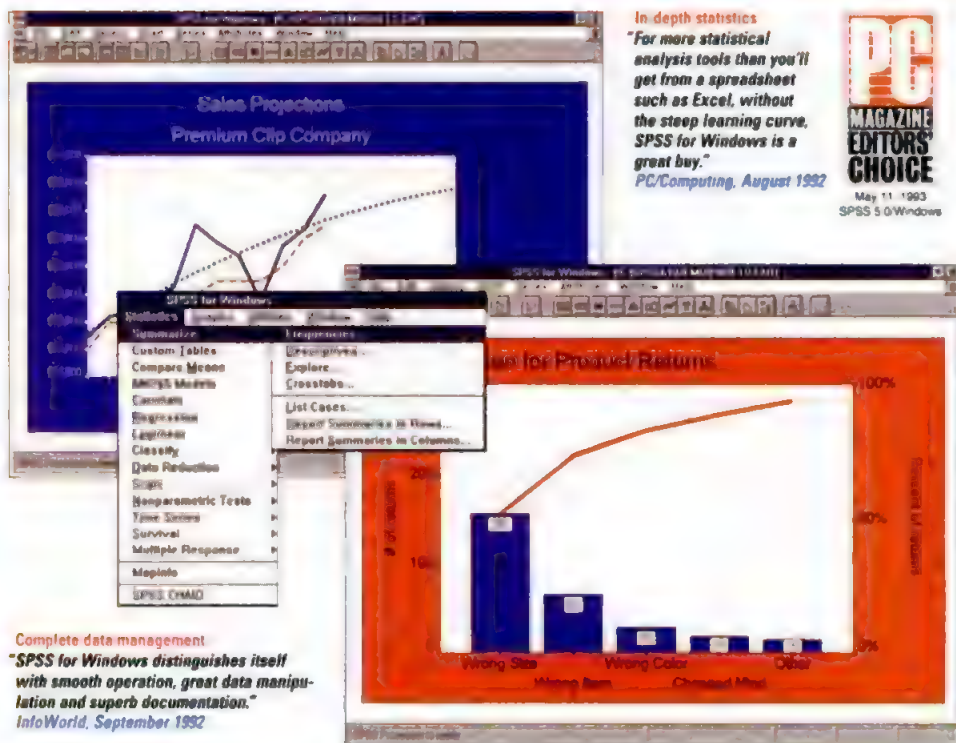
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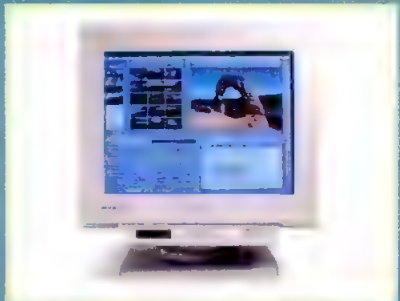
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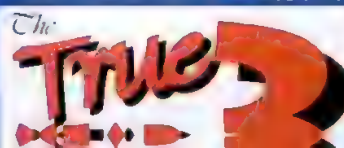
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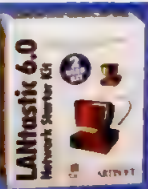
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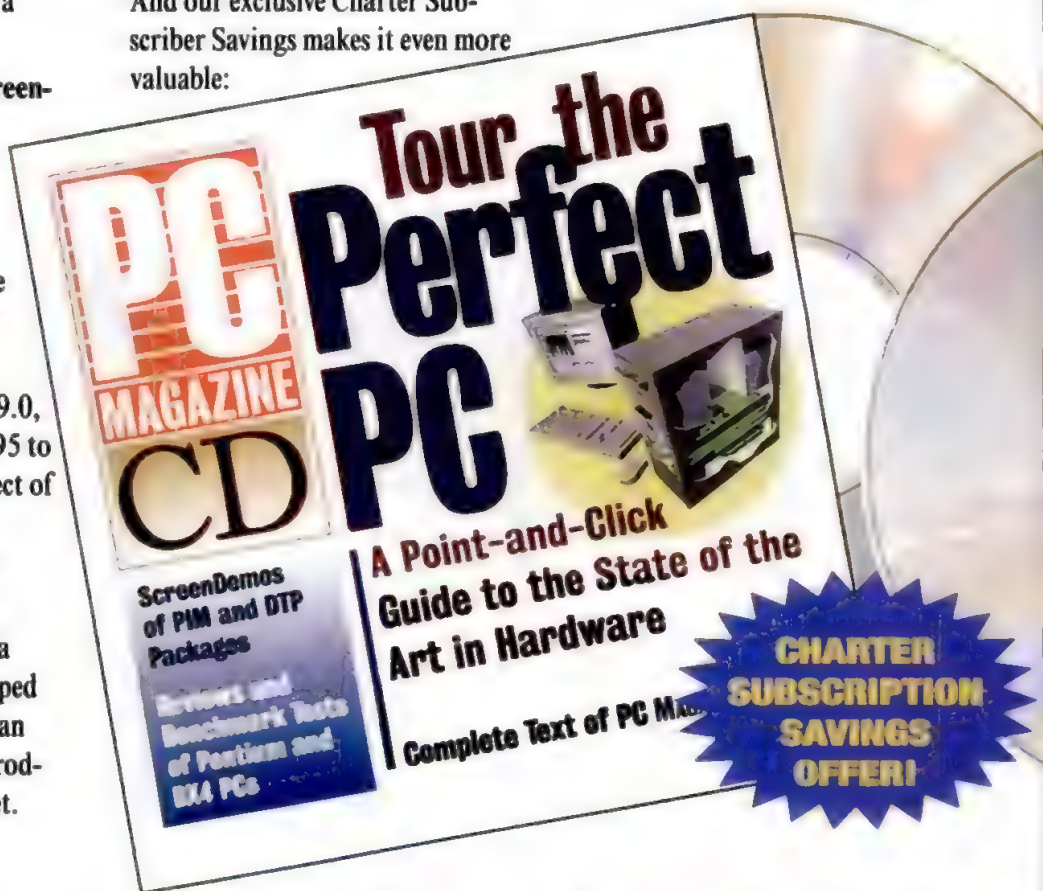
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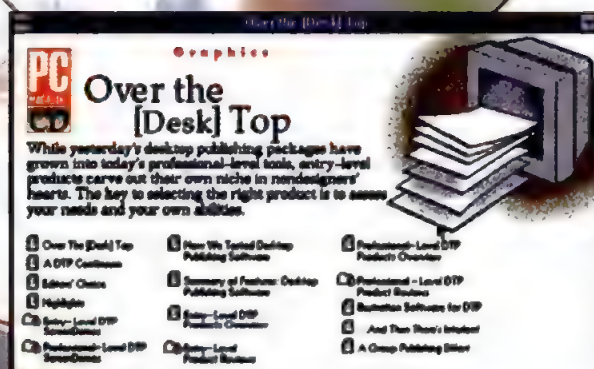
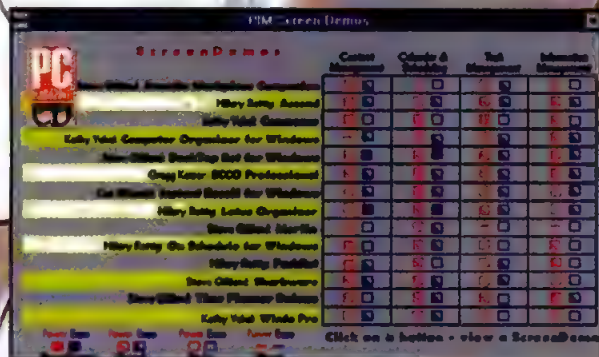
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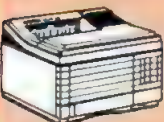
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PC394

Arlington Computer Took a Long Term Business Perspective but Used PC Magazine for Immediate Results.

When Arly Guenther started Arlington Computer, he decided to take a long term approach by taking care of his customers so they would come back and become repeat buyers. According to Arly, this long term approach pervades everything they do — customer service, technical support, and advertising.

"When we started the company in early 1984," says Arly, "we believed that our success as a direct marketer would be tied to customer satisfaction. So we attempted to go into the direct advertising arena. Our strategy was to sell branded products at competitive prices while continually responding to the changing needs of our customer base. Two or three years ago, people might wait two or three weeks for a product. Now they want it overnight, and they want much more sophisticated technical support. After ten years of being in business, we really feel that our support is among the best in the industry."

When Arly chose the direct marketing channel, he knew the best way to maximize the return on his investment was to target business buyers that have enterprise-wide buying responsibility and buy many products in volume. He selected PC Magazine back in 1986 because its readers have the knowledge and responsibility to buy products for themselves and their organizations. In fact, because of the large volume buying, "PC Magazine has become Arlington's flagship publication, because its buyers buy many different types of products resulting in high average order sizes. All of this brings more revenue to the bottom line, and has allowed Arlington to grow to its

present size."

"If you're in direct marketing for the long term, PC Magazine is an excellent choice. We run ads in PC Magazine consistently and have not missed an issue since day one." As a result, "last year alone our sales from PC Magazine were up over 30%." So, if you want your advertising message to reach the broadest, most sophisticated customer base, PC Magazine is definitely the place to be.

If you're a direct marketer with a breakthrough idea, bring it to the attention of 1,000,000 of the most active and knowledgeable PC buyers. Call your PC Magazine sales representative or (212) 503-5100 and get the facts about PC Direct.



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Circle 10 on Reader Service Card

How PC Direct Helped Computer Discount Warehouse Found "Customer Univ

All the employees at the Computer Discount Warehouse are still in school. No, they're not teenagers anymore, but they're all enrolled in a program called CDW University — which they also call "Customer U."

"We believe that the only way to grow is to make the customer #1," says Michael Krasny, the company's CEO. "That's why we established an on-going, mandatory training program that focuses on customer service and product briefings. Our employees also have personal, hands-on experience of a lot of the products they sell — and they know how to treat the customer right."

The customer support program at CDW, a ten-year-old reseller of PC hardware and software, includes free technical support from 8 a.m. to 7:30 p.m. "We guarantee that support calls will be answered within three minutes," says Krasny. He also points out that a \$10 million product inventory makes it possible for the company to provide same-day order shipment.

Computer Discount Warehouse has turned their success into an opportunity to offer better customer service, and Krasny singles out his advertising in PC Magazine as the cornerstone of his success. "We've been in the PC Direct section since 1986, and we've never missed an issue. Our most loyal customers, the ones who appreciate service, come to us through PC Magazine. No matter how you look at it — closing rate, calls per ad dollar — PC Magazine is tops."

If you're a direct marketer and you're looking for one million prospects who understand value and service, look no further than PC Direct. There's no better way to attract so many loyal, repeat customers.



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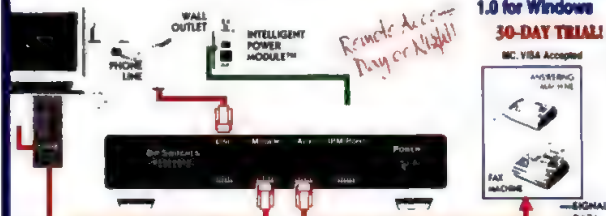
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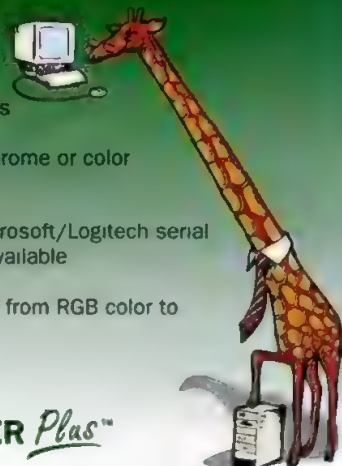
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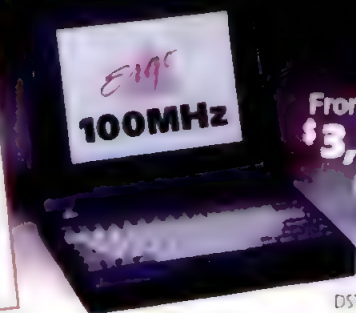
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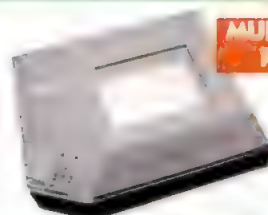
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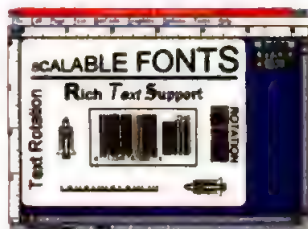
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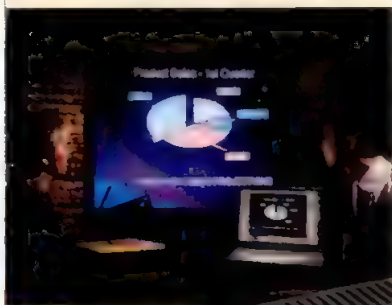
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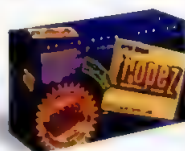


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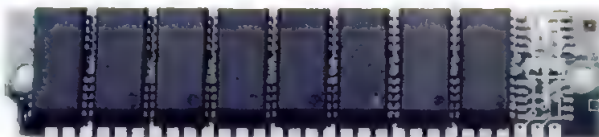
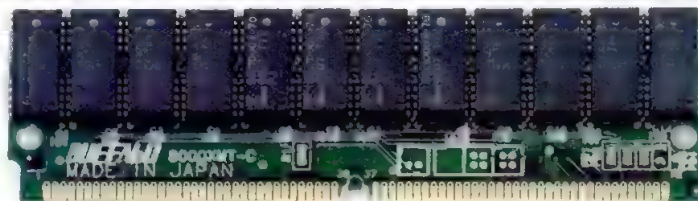
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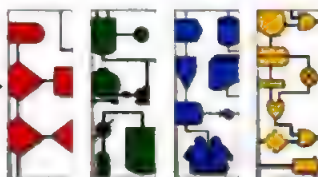
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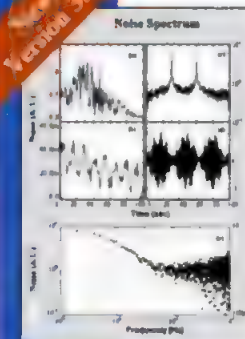
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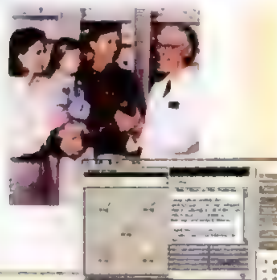
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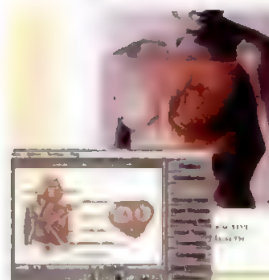


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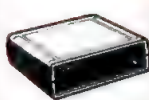
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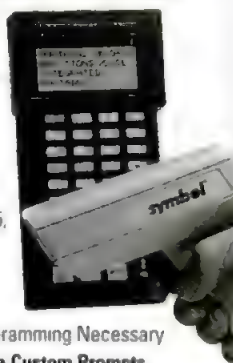
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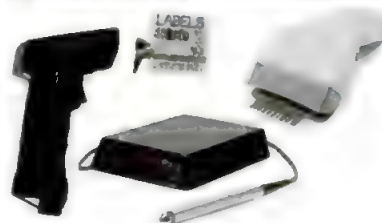
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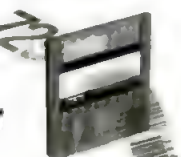


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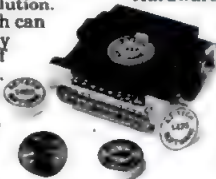
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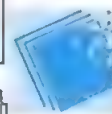
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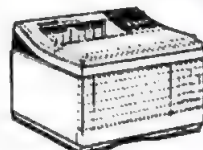
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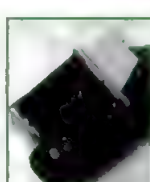
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4. Is your company a reseller?
01 ☐ Yes 02 ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products:

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6. Are there any PCs in your office?

- 01 ☐ Linked to mainframe
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7. Please check the equipment currently installed at your location: (Check all that apply.)

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8. Do you plan to buy any PC products?

- 01 ☐ Now 03 ☐ In 7 to 12 months
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Reader Service No.	Advertiser	Page
293	3 Com Corporation	130-131
874	3 Com Corporation	246
034	Acer America	81-85
273	Acer America	188-189
226	ADI Systems Inc	60
017	Advanced Micro Devices	5
*	Alpha Software Corporation	20-21
*	America Online, Inc.	367-368
162	American Power Conversion	101
025	American Small Business Computers	306
235	AMS	272-273
279	Arabesque Software Inc	63
336	Arlington Computer Products	314-315
898	ASP Computer Products	100
215	AST Research	74-75
323/241	AT&T Paradyne	168
023	AT&T	28
*	AT&T	89-91
127	ATI Technologies Inc	72
012	Austin Direct	289-294
287	Borland International	6
292	Caere Corporation	194-195
*	Canon Computer Systems	64-65
*	Compaq Computer Corporation	112-113
*	Compaq Computer Corporation	197
*	Compaq Computer Corporation	249
126	CompuAdd	312-313
144	CompUSA Direct	206-207
300	Computability	271
348	Computer Associates	2-3
400	Computer Associates	371
360	COMPUTER DISCOUNT WAREHOUSE	296-297
159	COMPUTER DISCOUNT WAREHOUSE	298-299
158	Computer Library	186
316	Comtrade	279
020	Corel Corporation	174
322	Corel Corporation	200
329	CTX International	322-323
*	Dell Computer Corporation	C5-C8
*	Dell Computer Corporation	183-185
050	Delphi Internet Services	165
206	Deneba Software	69
176	Diamond Multimedia Systems	232

Reader Service No.	Advertiser	Page
049	Digital Equipment Corporation	211-214
201	DTK Computer	86
*	Epson America	10-11
090	Everex Computer Systems	102
272	First Source International	275
014	First Source International	276-277
089	FOSA Computer Inc	327
200	FTG Data Systems	4
*	Gateway 2000	49
*	Gateway 2000	239-242
*	Gateway 2000	48a-h
281	Government Technology Services	41
391/138	H.Co Memory Upgrades	301
*	Hewlett Packard	58-59
*	IBM Corporation	146-149
*	IBM Corporation	172-173
278	INSIGHT DIRECT, INC	286-287
219	INSIGHT DIRECT, INC	318-319
027	INSIGHT DIRECT, INC	364
*	Inuit	33
921	Kingston Technology	192
019	L.A. Trade	288
*	Lotus Development Corporation	26-27
067	Mag Innovision	209
218	MapInfo Corporation	205
299	McAfee Associates, Inc	167
018	MegaHaus	295
321	Megahertz Corp	96-97
361	Micrografx	119
064	Micron Computer, Inc	153-158
203	Micron Computer, Inc	300
*	Microsoft	C2-C4,p1
*	Microsoft	180-181
010	Midwest Computer Works	281
398	Midwest Micro	260-268
177	MPC Technology, Inc	94
*	Nanao Corporation	223
217	NEC Technologies	76-77
045	NEC Technologies	104-105
044	NEC Technologies	106-107
157	NEC Technologies	216-217
222	NetManage, Inc	129
282	NexGen	176

Reader Service No.	Advertiser	Page
*	Nokia	23
056	Okidata	55
*	PC Connection	316-317
080	PC Power & Cooling	67
199	PC Zones	304-305
092	PCs Compleat	282-283
268	PCs Compleat	284-285
053	PerComp Microsystems, Inc	302-303
024	PerComp Microsystems, Inc	311
098	Pinnacle Micro	43
345	Powersoft Corporation	92
148	Primavera Systems	45
*	Prodigy Services Co	139-140
375	Publisher's Toolbox	310
046	Samsung Electronics America	98
*	Seagate Technology	115
*	ShapeWare	219
399	Sigma Designs, Inc	375
150	SmartPrint/Dresselhaus	226
028	Spry, Inc	171
043	SPSS, Inc	307
057	StatSoft	57
081	Sunshine Computers	325
175	Syquest Technology	198
166	TechWorks	280
001	Tektronix Inc	78
304	Texas Instruments	34-35
379	Toshiba America	162-163
088	Traveling Software	18
866	US Robotics Inc	36
210	USA Flex	308-309
118	View Sonic	133
373	Visual Software	151
085	WinBook Computer Corporation	135
*	WordPerfect/Novell Applications	13-15
*	WordPerfect/Novell Applications	16-17
*	Zenith Data Systems	52-53
151	Zeos Int'l	24-25
038	Zeos Int'l	70-71
155	Zeos Int'l	121-126

* No Reader Service #. Please Call Advertiser For Information.

Advertisers' Index PRODUCTS

Reader Service No.	Company	Product	Page	Reader Service No.	Company	Product	Page
ACCELERATOR BOARDS				MAIL ORDER			
166	TechWorks	Thunderbolt Accelerators	280	144	CompUSA Direct	Mail Order	206-207
ADD-ON BOARDS				067	Mag Innovation	Monitors	208
176	Diamond Multimedia Systems	Diamond Stealth 84	232	010	Midwest Computer Works	Monitors	281
391/138	H Co Memory Upgrades	Memory, PCMCIA	301	•	Nanac Corporation	Monitors	223
166	TechWorks	PC Memory	280	•	Nokia	Monitors	23
ANTI-VIRUS SOFTWARE				046	Samsung Electronics America	Monitors	96
290	McAfee Associates, Inc.	VirusScan/NetShield	167	118	View Sonic	Monitors	133
CAD/CAM				FAX MODEM			
025	American Small Business Computers	DesignCAD	306	323/241	AT&T Paradyne	Dataport Modem	168
CD-ROM				081	Sunshine Computers	Laptops/Notebooks	325
300	Computability	Mail Order	271	FINANCIAL PLANNING SOFTWARE			
150	Computer Library	Computer Select	186	400	Computer Associates	Simply Tax	371
322	Corel Corporation	Corel Photo CD	200	FLOWCHARTING			
278	INSIGHT DIRECT, INC.	CD ROM	286-287	361	Micrograts	ABC Flowchart & Snapgraphics	119
219	INSIGHT DIRECT, INC.	CD ROM	318-319	•	ShapeWare	Visio Graphics Software	219
027	INSIGHT DIRECT, INC.	CD ROM	364	GRAPHICAL INTERFACE			
CHIPS PROCESSORS				273	Acer America	OOBE	188-189
017	Advanced Micro Devices	AMD 486 Chips	5	GRAPHICS SOFTWARE			
391/138	H Co Memory Upgrades	Memory, PCMCIA	301	252	Caere Corporation	OmniPage	194-195
019	LA Trade	Memory	280	020	Corel Corporation	Draw 5	174
282	NexGen	Nx586	176	208	Deneba Software	Canvas for Windows	69
COMMUNICATIONS SOFTWARE				•	Nanac Corporation	Monitors	223
023	AT&T	Passageway Solutions	28	217	NEC Technologies	Multimedia Theatre	76-77
222	NetManage, Inc.	Internet Chameleon	129	•	Publisher's Toolkit	Graphics Products	310
026	Spry, Inc.	Internet-In-Box	171	375	ShapeWare	Visio Graphics Software	219
080	Traveling Software	LapLink for Windows	18	373	Visual Software	Simply 3-D	151
•	WordPerfect/Novell Applications	Perfect Office	13-15	HARD DRIVES			
COMPUTERS/COMPATIBLES				300	Computability	Mail Order	271
034	Acer America	PC's and Notebooks	81-85	278	INSIGHT DIRECT, INC.	Hard Drives	286-287
273	Acer America	OOBE	188-189	219	INSIGHT DIRECT, INC.	Hard Drives	318-319
336	Arlington Computer Products	Peripherals, Mail Order	314-315	027	INSIGHT DIRECT, INC.	Hard Drives	364
•	AT&T	AT&T GIS PCs	89-91	018	MegaHaus	Drives/Storage	295
012	Austin Direct	Austin Notebooks & Desktops	289-294	175	Syquest Technology	Syquest 270MG 3.5" Hard Drive	196
•	Compaq Computer Corporation	XE/XL, Contura, Elite	112-113	HARDWARE			
•	Compaq Computer Corporation	Contura	197	874	3 Com Corporation	3Com Etherlink	246
•	Compaq Computer Corporation	LTE/Elite Direct	249	144	CompUSA Direct	Mail Order	206-207
126	CompUSA Direct	Desktop and Tower Systems	312-313	316	Comrade	Systems	278
144	CompUSA Direct	Mail Order	206-207	329	CTX International	Notebooks	322-323
360	COMPUTER DISCOUNT WAREHOUSE	Hardware	296-297	921	Kingston Technology	Portable Products	192
159	COMPUTER DISCOUNT WAREHOUSE	Hardware	296-299	018	MegaHaus	Drives/Storage	295
318	Contrade	Systems	279	398	Midwest Micro	Notebooks/Systems/Peripherals	260-268
•	Dell Computer Corporation	Desktops	C5-C8	199	PC Zones	Mail Order	304-305
•	Dell Computer Corporation	Dell Notebooks	183-185	INFORMATION MANAGERS			
049	Digital Equipment Corporation	Desktops	211-214	279	Arabesque Software Inc.	Echo	83
201	DTK Computer	Systems	86	345	Powersoft Corporation	Information Management Software	82
089	FOSA Computer Inc.	Portables	327	INPUT DEVICES			
•	Gateway 2000	Pentium PCs	49	•	Epson America	Epson Scanners	10-11
•	Gateway 2000	PCs	239-242	200	FTG Data Systems	Input/Output Devices	4
•	Gateway 2000	PCs	48a-b	LAN ADAPTER BOARDS			
•	Hewlett Packard	HP Vectra PCs	58-59	874	3 Com Corporation	3Com Etherlink	246
•	IBM Corporation	Valuepoint Systems	146-149	921	Kingston Technology	Portable Products	192
•	IBM Corporation	Thinkpad	172-173	LAPTOPS/PORTABLE COMPUTERS			
278	INSIGHT DIRECT, INC.	Mail Order Systems	286-287	034	Acer America	PC's and Notebooks	81-85
219	INSIGHT DIRECT, INC.	Mail Order Systems	318-319	235	AMS	Notebooks	272-273
027	INSIGHT DIRECT, INC.	Mail Order Systems	364	215	AST Research	Notebook Computers	74-75
064	Micron Computer, Inc.	Micron PCs	153-158	012	Austin Direct	Austin Notebooks & Desktops	289-294
018	Midwest Computer Works	PCs, Hardware	281	•	Compaq Computer Corporation	XE/XL, Contura, Elite	112-113
398	Midwest Micro	Desktop Systems	260-268	•	Compaq Computer Corporation	Contura	197
092	PCs Complete	Mail Order	282-283	•	Compaq Computer Corporation	LTE/Elite Direct	249
092	PCs Complete	Mail Order	282-283	144	CompUSA Direct	Mail Order	206-207
258	PCs Complete	Mail Order	284-285	360	COMPUTER DISCOUNT WAREHOUSE	Laptops	296-297
053	PerComp Microsystems, Inc.	Mail Order	302-303	159	COMPUTER DISCOUNT WAREHOUSE	Laptops	298-299
024	PerComp Microsystems, Inc.	Mail Order	311	329	CTX International	Notebooks	322-323
379	Toshiba America	Notebook Computers	162-163	•	Dell Computer Corporation	Notebooks	C5-C8
210	USA Flex	Desktop PCs	308-309	•	Dell Computer Corporation	Dell Notebooks	183-185
•	Zenith Data Systems	Z-Noteflex Modular	52-53	201	DTK Computer	Systems	86
036	Zeos Int'l	Server/Ambra	70-71	090	Everex Computer Systems	Everex StepNote	102
155	Zeos Int'l	Zeos Pentium PCs	121-126	083	FOSA Computer Inc.	Portables	327
DATA BASE MANAGERS				•	Gateway 2000	Notebooks	49
•	Alpha Software Corporation	Alpha Software	20-21	•	Gateway 2000	Notebooks	239-242
279	Arabesque Software Inc.	Echo	83	•	Gateway 2000	Notebooks	48a-b
267	Borland International	Paradox for Windows 5.0	6	•	IBM Corporation	Thinkpad	172-173
346	Computer Associates	Open Ingres	2-3	010	Midwest Computer Works	PCs, Hardware	281
281	Government Technology Services	Relational Database Software	41	398	Midwest Micro	Notebooks	260-268
•	Lotus Development Corporation	Lotus Approach	26-27	177	MPC Technology, Inc.	Multimedia Notebooks	94
361	Micrograts	ABC Flowchart & Snapgraphics	119	157	NEC Technologies	NEC Versa	216-217
DESK TOP PUBLISHING				081	Sunshine Computers	Laptops/Notebooks	325
020	Corel Corporation	Draw 5	174	304	Texas Instruments	Ti TravelMate Notebooks	34-35
•	Microsoft	Microsoft Word	180-181	379	Toshiba America	Notebook Computers	162-163
DISK BACKUP & TAPE DRIVES				210	USA Flex	Notebooks	308-309
300	Computability	Mail Order	271	085	WinBook Computer Corporation	Winbook	135
018	MegaHaus	Drives/Storage	295	•	Zenith Data Systems	Z-Noteflex Modular	52-53
DISPLAYS/MONITORS				151	Zeos Int'l	Mendian Color Notebooks	24-25
228	ADI Systems Inc.	Monitors	60				

Advertisers' Index PRODUCTS

Reader Service No.	Company	Product	Page	Reader Service No.	Company	Product	Page
LOCAL AREA NETWORKING				OPTICAL PERIPHERALS			
293	3 Com Corporation	3Com Parallel Tasking	130-131	222	NetManage, Inc.	Internet Chameleon	129
874	3 Com Corporation	3Com Etherlink	246	•	Prodigy Services Co.	Prodigy Online Service	139-140
896	ASP Computer Products	ServerJet	100	028	Spry, Inc.	Internet-In-Box	171
300	Computability	Mail Order	271	ORGANIZATIONAL SOFTWARE			
360	COMPUTER DISCOUNT WAREHOUSE	Networking Products	296-297	•	Epson America	Epson Scanners	10-11
159	COMPUTER DISCOUNT WAREHOUSE	Networking Products	298-299	217	NEC Technologies	Multimedia Theatre	76-77
MAIL ORDER				098	Pinnacle Micro	Optical Drives	43
834	Acer America	PC's and Notebooks	81-85	PC DIRECT			
235	AMS	Notebooks	272-273	025	American Small Business Computers	DesignCAD	306
336	Arlington Computer Products	Mail Order	314-315	235	AMS	Notebooks	272-273
•	AT&T	AT&T GIS PCs	89-91	336	Arlington Computer Products	Peripherals, Mail Order	314-315
012	Austin Direct	Austin Notebooks & Desktops	289-294	012	Austin Direct	Austin Notebooks & Desktops	289-294
•	Compaq Computer Corporation	XE/XL, Contura, Elite	112-113	126	CompuAdd	Desktop and Tower Systems	312-313
•	Compaq Computer Corporation	Contura	197	300	Computability	Mail Order	271
•	Compaq Computer Corporation	LTE/Elite Direct	249	360	COMPUTER DISCOUNT WAREHOUSE	Hardware/Peripherals/Mail Order	296-297
126	CompuAdd	Desktop and Tower Systems	312-313	159	COMPUTER DISCOUNT WAREHOUSE	Hardware/Peripherals/Mail Order	298-299
144	CompUSA Direct	Mail Order	206-207	316	Contrade	Systems	279
300	Computability	Mail Order	271	329	CTX International	Notebooks	322-323
360	COMPUTER DISCOUNT WAREHOUSE	Resellers	296-297	272	First Source International	Memory, Software, Peripherals	275
159	COMPUTER DISCOUNT WAREHOUSE	Resellers	298-299	014	First Source International	Memory, Software, Peripherals	276-277
316	Contrade	Systems	279	089	FOSA Computer Inc.	Portables	327
329	CTX International	Notebooks	322-323	278	INSIGHT DIRECT, INC.	Systems/Hard Drives/CDROM	286-287
049	Digital Equipment Corporation	Desktops & Printers	211-214	219	INSIGHT DIRECT, INC.	Systems/Hard Drives/CDROM	318-319
201	DTK Computer	Systems	86	027	INSIGHT DIRECT, INC.	Systems/Hard Drives/CDROM	364
272	First Source International	Memory, Software, Peripherals	275	019	LA Trade	Memory	288
814	First Source International	Memory, Software, Peripherals	276-277	018	MegaHaus	Drives/Storage	295
089	FOSA Computer Inc.	Portables	327	203	Micron Computer, Inc.	Micron Memory	300
•	Gateway 2000	Mail Order	49	010	Midwest Computer Works	PCs, Monitors, Mail Order	281
•	Gateway 2000	Mail Order	238-242	398	Midwest Micro	Notebooks/Systems/Peripherals	280-288
•	Gateway 2000	Mail Order	48a-h	•	PC Connection	Mail Order	316-317
391/138	H Co Memory Upgrades	Memory, PCMCIA, Fax/Modems, LAN	301	199	PC Zones	Mail Order	304-305
•	IBM Corporation	Valuepoint Systems	148-149	092	PCs Complete	Mail Order	282-283
•	IBM Corporation	Thinkpad	172-173	268	PCs Complete	Mail Order	284-285
018	MegaHaus	Drives/Storage	295	053	PerComp Microsystems, Inc.	Mail Order	302-303
010	Midwest Computer Works	Mail Order	281	024	PerComp Microsystems, Inc.	Mail Order	311
•	PC Connection	Mail Order	316-317	375	Publisher's Toolbox	Graphics & Windows Products	310
199	PC Zones	Mail Order	304-305	043	SPSS, Inc.	Statistical/Windows Software	307
268	PCs Complete	Mail Order	284-285	081	Sunshine Computers	Laptops/Notebooks	325
053	PerComp Microsystems, Inc.	Mail Order	302-303	186	TechWorks	Accelerators & PC Memory	280
024	PerComp Microsystems, Inc.	Mail Order	311	210	USA Flex	Systems, Peripherals, Printers	308-309
375	Publisher's Toolbox	Mail Order	310	PCMCIA			
081	Sunshine Computers	Laptops/Notebooks	325	272	First Source International	Memory, Software, Peripherals	275
186	TechWorks	Accelerators & PC Memory	280	814	First Source International	Memory, Software, Peripherals	276-277
151	Zaos Int'l	Mendian Color Notebooks	24-25	391/138	H Co Memory Upgrades	Fax/Modem, Flash, SRAM, Drives	301
038	Zaos Int'l	Server/Ambra	70-71	921	Kingson Technology	Portable Products	192
155	Zaos Int'l	Zaos Pentium Pentium PCs	121-126	321	Megahertz Corp.	Megahertz Modems	96-97
MAPPING SOFTWARE				866	US Robotics Inc.	Sportster v.34	36
218	MapInfo Corporation	Desktop Mapping Software	205	PERIPHERAL SHARING DEVICE			
MASS STORAGE				898	ASP Computer Products	ServerJet	100
300	Computability	Mail Order	271	150	SmartPrint/Dressethaus	Smart Print	226
018	MegaHaus	Drives/Storage	295	PERIPHERALS			
•	Seagate Technology	Hard Drives	115	293	3 Com Corporation	3Com Parallel Tasking	130-131
175	Syquest Technology	SyQuest 270MB 3.5" Hard Drive	198	874	3 Com Corporation	3Com Etherlink	246
MEMORY				336	Arlington Computer Products	Peripherals	314-315
272	First Source International	Memory, Software, Peripherals	275	323/241	AT&T Paradyne	Dataport Modem	168
014	First Source International	Memory, Software, Peripherals	276-277	360	COMPUTER DISCOUNT WAREHOUSE	Peripherals	296-297
391/138	H Co Memory Upgrades	Memory	301	159	COMPUTER DISCOUNT WAREHOUSE	Peripherals	298-299
019	LA Trade	Memory	288	•	Epson America	Epson Scanners	10-11
203	Micron Computer, Inc.	Micron Memory	300	014	First Source International	Memory, Software, Peripherals	276-277
MODEMS				•	Gateway 2000	Peripherals	49
323/241	AT&T Paradyne	Dataport Modem	168	•	Gateway 2000	Peripherals	238-242
300	Computability	Mail Order	271	•	Gateway 2000	Peripherals	48a-h
321	Megahertz Corp.	Megahertz Modems	96-97	278	INSIGHT DIRECT, INC.	Peripherals	286-287
866	US Robotics Inc.	Sportster v.34	36	219	INSIGHT DIRECT, INC.	Peripherals	318-319
MULTI-MEDIA				027	INSIGHT DIRECT, INC.	Peripherals	364
316	Contrade	Systems	279	398	Midwest Micro	Peripherals	280-288
322	Corel Corporation	Corel Photo CD	200	375	Publisher's Toolbox	Graphics & Windows Products	310
178	Diamond Multimedia Systems	Diamond Stealth 64	232	175	Syquest Technology	SyQuest 270MB 3.5" Hard Drive	198
•	Epson America	Epson Scanners	10-11	210	USA Flex	Peripherals	308-309
278	INSIGHT DIRECT, INC.	Multimedia	286-287	POWER PROTECTION			
219	INSIGHT DIRECT, INC.	Multimedia	318-319	162	American Power Conversion	Back-UPS	101
027	INSIGHT DIRECT, INC.	Multimedia	364	080	PC Power & Cooling	PowerProtection/Cooling Devices	67
177	MPC Technology, Inc.	MultiMedia Notebooks	94	PRESENTATION SOFTWARE			
399	Sigma Design, Inc.	Video Capture Board	375	020	Corel Corporation	Draw 5	174
118	View Sonic	Monitors	132	322	Corel Corporation	Corel Photo CD	200
MULTIMEDIA SOFTWARE				•	Microsoft	Microsoft Office	C2-C4, p1
322	Corel Corporation	Corel Photo CD	200	PRINTER ACCESSORIES			
373	Visual Software	Simply 3-D	151	898	ASP Computer Products	ServerJet	100
NETWORK INTERFACE CARDS				150	SmartPrint/Dressethaus	Smart Print	226
293	3 Com Corporation	3Com Parallel Tasking	130-131	PRINTERS			
NETWORKING SOFTWARE				•	Canon Computer Systems	Canon BJC-4000	64-65
299	McAfee Associates, Inc.	VirusScan/NetShield	167	300	Computability	Mail Order	271
ON LINE DATABASE				049	Digital Equipment Corporation	Printers	211-214
•	America Online, Inc.	America Online	367-368	045	NEC Technologies	Printers 660	104-105
050	Delphi Internet Services	Internet Mail Gateway	185				

**Reader
Service**

Reader Service No.	Company	Product	Page
044	NEC Technologies	Printers Color 3000	106-107
056	Olidata	OL400e	55
081	Sunshine Computers	Laptops/Notebooks	325
001	Tektronix Inc.	Tektronix Printers	79
210	USA Flex	Printers	306-309

PROGRAMMERS TOOLS UTILITIES

345	Powersoft Corporation	Information Management Software	92
-----	-----------------------	---------------------------------	----

PROJECT MANAGEMENT

148	Primavera Systems	SureTrak	45
-----	-------------------	----------	----

REMOTE COMPUTING

175	Syquest Technology	SyQuest 270MG 3.5" Hard Drive	198
868	US Robotics Inc.	Sportster v.34	36

RESELLERS

010	Midwest Computer Works	Reseller	281
081	Sunshine Computers	Laptops/Notebooks	325

SCANNERS

*	Epson America	Epson Scanners	18-11
---	---------------	----------------	-------

SERVERS

348	Computer Associates	Open Ingres	2-3
*	IBM Corporation	Valuepoint Systems	146-147
038	Zeos Int'l	Server/Ambra	70-71

SOFTWARE

025	American Small Business Computers	DesignCAD	306
279	Arabesque Software Inc.	Echo	63
287	Borland International	Paradox for Windows 5.0	6
300	Computability	Mail Order	271
206	Deneba Software	Canvas for Windows	69
272	First Source International	Memory, Software, Peripherals	275
281	Government Technology Services	Relational Database Software	41
*	Microsoft	Microsoft Office	C2-C4,p1
*	Microsoft	Microsoft Word	180-181
199	PC Zones	Mail Order	304-305
*	ShapeWare	Visio Graphics Software	219
043	SPSS, Inc.	Statistical/Windows Software	307
088	Traveling Software	LapLink for Windows	18
373	Visual Software	Simply 3-D	151

SPREADSHEET/TEMPLATES

*	Microsoft	Microsoft Office	C2-C4,p1
*	WordPerfect/Novell Applications	Perfect Office	13-15

STATISTICAL SOFTWARE

043	SPSS, Inc.	Statistical Software	307
057	StatSoft	Statistical Software	57

TAX SOFTWARE

400	Computer Associates	Simply Tax	371
*	Inuit	Tax Software	33

TIME MANAGEMENT SOFTWARE

279	Arabesque Software Inc.	Echo	63
-----	-------------------------	------	----

VIDEO GRAPHICS/BOARDS

127	ATI Technologies Inc.	Mach 64-Bit Accelerator	72
300	Computability	Mail Order	271
176	Diamond Multimedia Systems	Diamond Stealth 64	232
399	Sigma Design, Inc.	Video Capture Board	375

WINDOWS SOFTWARE

025	American Small Business Computers	DesignCAD	306
279	Arabesque Software Inc.	Echo	63
348	Computer Associates	Open Ingres	2-3
400	Computer Associates	Simply Tax	371
206	Deneba Software	Canvas for Windows	69
*	Lotus Development Corporation	Lotus Approach	26-27
361	Micrograph	ABC Flowchart & Snapgraphics	119
361	Micrograph	ABC Flowchart & Snapgraphics	119
*	Microsoft	Microsoft Office	C2-C4,p1
*	Microsoft	Microsoft Word	180-181
148	Primavera Systems	SureTrak	45
375	Publisher's Toolbox	Windows Products	310
*	ShapeWare	Visio Graphics Software	219
026	Spry, Inc.	Internet-In-Box	171
043	SPSS, Inc.	Windows Software	307
057	StatSoft	Statistical Software	57
088	Traveling Software	LapLink for Windows	18
373	Visual Software	Simply 3-D	151
*	WordPerfect/Novell Applications	Perfect Office	13-15
*	WordPerfect/Novell Applications	WP 6.1	16-17

WORD PROCESSING SOFTWARE/AIDS

*	Microsoft	Microsoft Word	180-181
*	WordPerfect/Novell Applications	Perfect Office	13-15
*	WordPerfect/Novell Applications	WP 6.1	16-17

WORKSTATIONS

*	Zenith Data Systems	Z-Noteflex Modular	52-53
---	---------------------	--------------------	-------

For Additional Categories See MARKETPLACE PRODUCT INDEX Page 371.



Coming Up

Windows Utilities

Microsoft Windows 3.1 may be aging, but it's still far from dead. To help you get the most out of the Windows legacy, we review 35 low-cost shells, file viewers, and file finders that help you launch your programs, view and manage your documents, expand your screen real estate, and generally organize your desktop. The most advanced offer total makeovers through state-of-the-art, object-oriented shells. Here's how to bring Windows up to date—for however long you'll be using it.

Virtual Reality

Virtual reality has developed rapidly in the past couple of years, and it promises to keep moving ahead with lightning speed. We provide an overview of VR technology, illustrate a typical VR setup, and discuss different software and hardware options, thereby bringing the otherworldly features of VR safely into your sphere.

Communications Software

Today, communications software packages are so feature-rich and powerful that we hardly have the space to show you all they can do. The market now includes packages that try to fill all your telecommunicating needs, giving you fax and data communications in one box. How extensive and easy to use are the scripting languages? Can your package auto-detect your modem on installation? Does the product support RIPscrip? We review 14 general-communications software programs to answer these questions and more.

V.34 Modems

You don't have to wait any longer. The V.34 standard is in place, and V.34-compliant modems are on the streets. PC Magazine Labs puts 16 V.34 modems through its usual battery of tests—plus a few new ones—to find the new standard-bearers. We also consider cost issues and show you which modems have the edge on such features as LCDs, LEDs, and volume controls.

Extending PageMaker 5.0

We might like to think of desktop publishing as an art, but in the context of cranking out publications, it's often more a business. And like every business, it must address such issues as increased productivity and faster turnaround time. To help increase your productivity, next issue's Extending Your Apps shows you how even a nonprogramming user can create scripts to automate repetitive tasks within PageMaker 5.0. □

Editorial Product Index

Reader Service No.	Product	Company	Page
480	Act! Link	Symantec Corp.	61
444	AM-Tax Personal 1040	AM Software Inc.	204
	AMD K5	Advanced Micro Devices	177
460	America Online	America Online Inc.	127
468	Atlas GIS, Version 3.0	Strategic Mapping Inc.	61
411	AutoCAD, Release 13	Autodesk Inc.	42
478	BusinessObjects, Version 3.1	Business Objects	68
405	Check Printing Accountant KX-RC90	Matsushita Consumer Electronics Co.	48
402	Clean Sweep for Windows	Quarterdeck Office Systems	47
442	Codewrite Fusion	Premia Corporation	247
461	CompuServe Information Service	CompuServe Inc.	128
469	ComputerEyes/LPT	Digital Vision Inc.	61
	Cyrix M1	Cyrix	177
404	Day to Day Contacts, Version 3.0	Portfolio Software Inc.	48
462	Delphi Internet	Delphi Internet Services Corp.	138
481	Diamond Pro 17TX	Mitsubishi Electronics	68
481	Diamond Pro 21TX	Mitsubishi Electronics	68
417	Dimension XPS P100	Dell Computer Corp.	37
463	Dow Jones News/Retrieval with MCI Mail	Dow Jones & Company Inc./MCI Global Messaging Services	145
412	Drag And Zip, Version 5.0	Canyon Software	56
477	EXP CD-940	EXP Memory Inc.	62
415	Fractal Design Painter, Version 3	Fractal Design Corp.	44
959	The Frye Utilities for Networks	Frye Computer Systems Inc.	NE12
467	Gateway Liberty	Gateway 2000	61
418	Gateway P5-100XL	Gateway 2000	37
418	Gateway P5-75 Family PC	Gateway 2000	37
464	GEIE	GE Information Services Inc.	150
450	IBM PC 750-P100	IBM Personal Computer Co.	37
471	IconAuthor, Version 6.0	AimTech Corp.	66
	Intel Pentium (P54C)	Intel Corp.	177
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476	JVC XR-W2001 2X	JVC Information Products Company of America	68
449	Kiplinger's TaxCut for DOS	Kiplinger	208
449	Kiplinger's TaxCut for Windows	Kiplinger	208
408	Kodak XLS 8600 PS Printer	Eastman Kodak Co.	50
473	KPT Convolver	HSC Software	62
452	Merriam Webster's Dictionary for Kids	Mindscape Inc.	365
451	Micron P100 Millennia-100	Micron Computer Inc.	37
458	Microsoft Complete NBA Basketball	Microsoft Corp.	370
960	Microsoft Systems Management Server, Version 1.0	Microsoft Corp.	NE18
401	More PC Tools for DOS & Windows	Symantec Corp., Peter Norton Group	47
453	Morgan's Trivia Machine	Morgan Interactive Inc.	365
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962	NetWare, Version 4.1	Novell Inc.	NE23
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465	Prodigy	Prodigy Services Co.	152
456	The Rabbits at Home	Online Computer Systems	374
403	Ray Dream Designer, Version 3	Ray Dream Inc.	46
454	Rescue the Scientists	Compton's NewMedia	370
414	Same<=>Same, Version 2.2	DPM Computer Solutions	56
447	Simply Tax for Windows	4Home Productions	210
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446	TaxSaver for Windows	WordPerfect Corp.	218
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451	TurboTax for DOS	Intuit Inc.	224
451	TurboTax for Windows	Intuit Inc.	224
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455	Where in the World is Carmen Sandiego? Junior Detective Edition	Broderbund Software	370
410	Your Mutual Fund Selector	Intuit	54

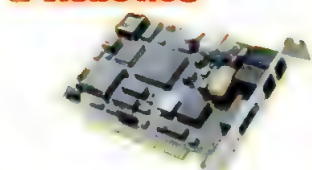
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Network SurgeArrest w/Telephone.....	39

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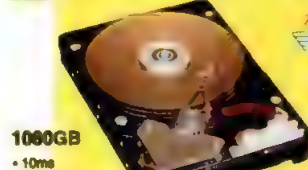
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Price

Fun-Filled Facts: Learning Games for Kids

You can lead a child to a PC, but you can't make him learn—unless you make the lessons fun. The more educational content software has, the more entertaining it needs to be if your kids are going to spend enough time with it to learn anything. The best software for kids takes fun into consideration by making learning a game. In some cases, a product succeeds so well at turning education into entertainment that your kids will never know they're really learning unless you tell them.

These four educational games tackle everything from geography to science to language in a lighthearted, highly interactive way that makes the learning all but undetectable.

Merriam-Webster's Dictionary for Kids

Mindscape Inc.; 415-883-3000.

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★★★★★ CD-ROM 6th \$49.95

There's something about Merriam-Webster's Dictionary for Kids that tells you right away it isn't designed with adult users in mind. It may be the bold, brightly colored graphics, or it may be something in the program's brash attitude. The Search icon, for in-

stance, initiates its surprisingly fast lookup procedures with a loud quack. Other features allow you to click on a Mouth icon to hear a word pronounced or on a Part of Speech icon to learn the difference between an adverb and a verb. While there are over 32,000 entries, only about 500 are enhanced with photographs, drawings, or animations.

The five games included on this CD-ROM are all attractive, slightly unhinged variations on popular themes. Alphabet Soup, for example, is a word search game in which the host (and hint giver) is a cockroach. Other games include variations on Concentration, Hangman, Cryptograms, and Laddergrams.



Merriam-Webster's Dictionary for Kids adds a twist to traditional word games like Hangman.

Unfortunately, there are no links between the dictionary and the games, so you can't click on a word to bring up its definition while playing. Further, the exaggerated laughter you hear if you give up in a game hardly constitutes positive reinforcement.

—Barry Brenesal

Morgan's Trivia Machine

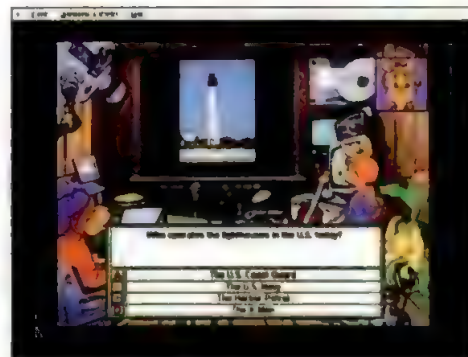
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Morgan is a chimp with class. He and his friends—Bernardvark, Skatergator, Kangaruth, Alicat, and Hip-Hop Hippo—invite you into Morgan's tree house, where you'll learn about sci-



Morgan's Trivia Machine offers players over 1,000 questions on science, geography, and more.

ence, geography, and other topics in a humorous environment.

Once you're in the tree house, you can play a variety of trivia-based games. Morgan's Trivia Machine, the HAM 9000, offers some important choices for game setup, including the number of characters who will play, the identities of the characters who will be playing on-screen for you, the skill level of each player, the subject covered, and your choice of three games to play.

The first game, Score More, challenges you to answer more questions correctly than your opponent to earn more points; the second, Mountain Climbing

AFTER HOURS INDEX

Learning Games for Kids

Merriam-Webster's Dictionary for Kids.....365
Morgan's Trivia Machine.....365
Rescue the Scientists.....370
Where in the World is Carmen Sandiego? Junior Detective Edition.....370

CD-ROM Pick Hit

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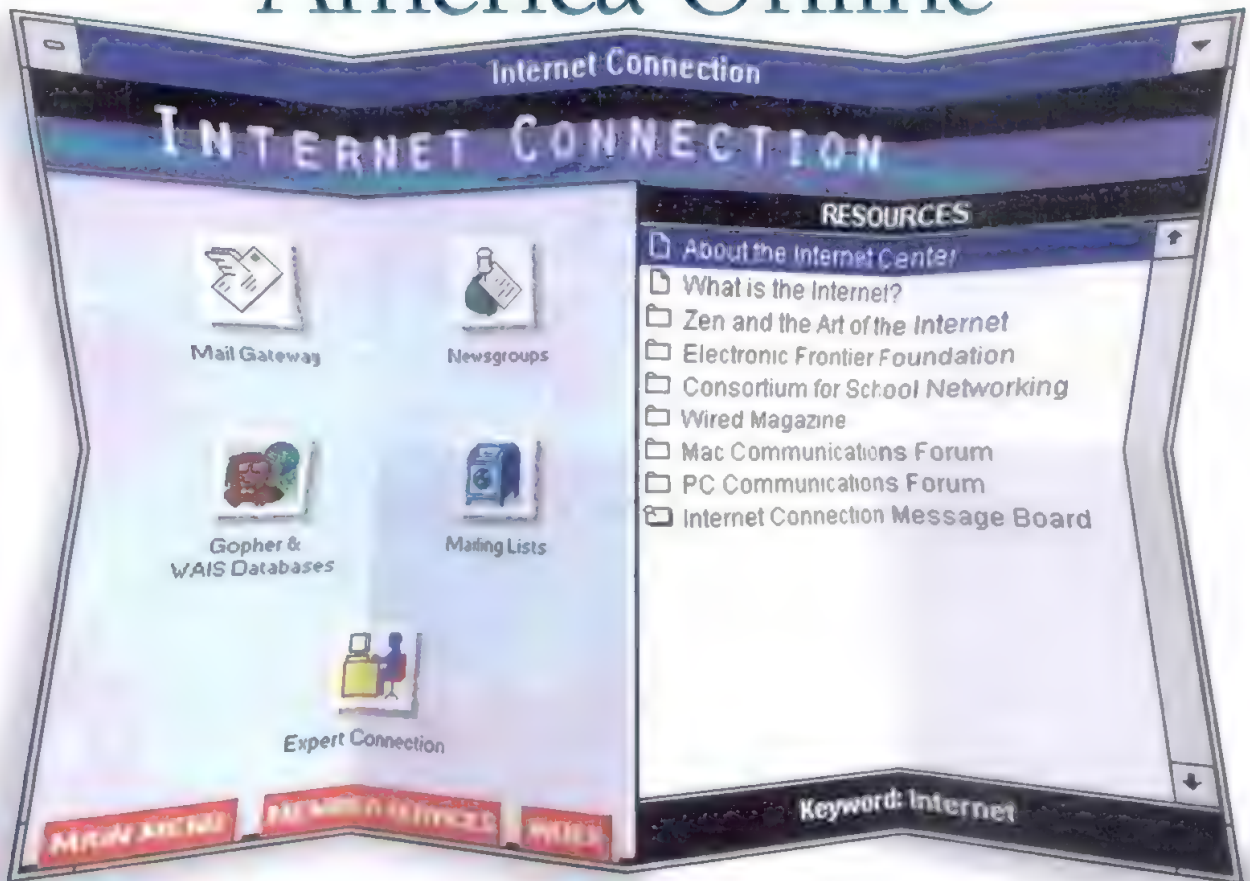
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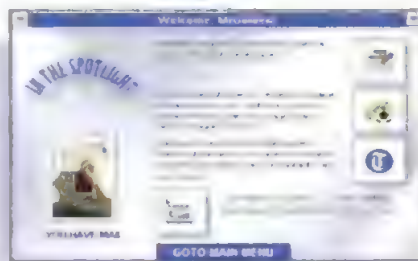
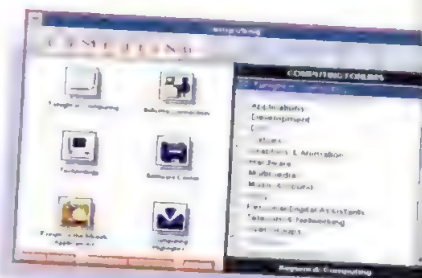
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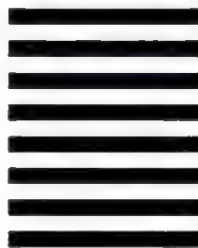
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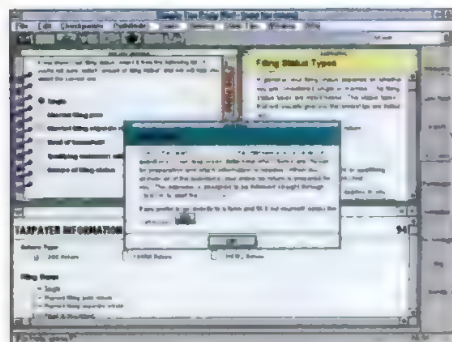
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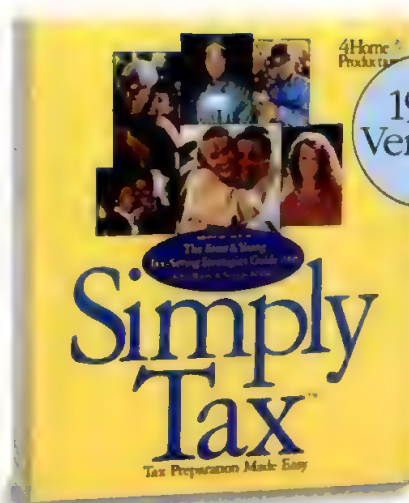
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SPOTLIGHT ON
ADVENTURE

The Journeyman Project Turbo

When *The Journeyman Project* was released in 1993, it was hailed for its full-motion video, photo-realistic backgrounds, and lifelike ambient sound. Almost every facet of the program earned praise—except its dismally slow speed. *The Journeyman Project Turbo* retains the virtues of the original while running turbo-fast.

This science-fiction adventure has all the classic elements—time travel, robots, matter transmission, even a mad scientist. It is the year 2318, and Earth's technologies serve peaceful and productive purposes. The united peoples of Earth are about to join a star-spanning federation called the Symbiotry of Peaceful Beings, when someone's time-travel tampering interferes with the union. As an agent of the Temporal Protectorate, your job is to restore the normal course of history and to apprehend whoever is causing these temporal rifts.

The game's interface and puzzles are tightly integrated with the story. You view the action through your implanted



BioTech Interface, activate BioChips for special functions, and control your protective time-travel BioSupport suit using simple directional controls. In the process of repairing three temporal rifts, you'll have to disarm a bomb using logic, traverse a maze before your oxygen runs out, and even demonstrate your skills at world geography. If you get stuck, you can return to base and try a different mission (though you'll lose points). Each mission has a violent

and a nonviolent solution; nonviolence is rewarded. Our only complaint is that with the new turbo speed, the game is over too quickly! Look for a sequel, *Buried in Time*, to be released sometime in the spring of 1995.

—Neil J. Rubenking

Sanctuary Woods Multimedia Corp.; 800-245-4525.

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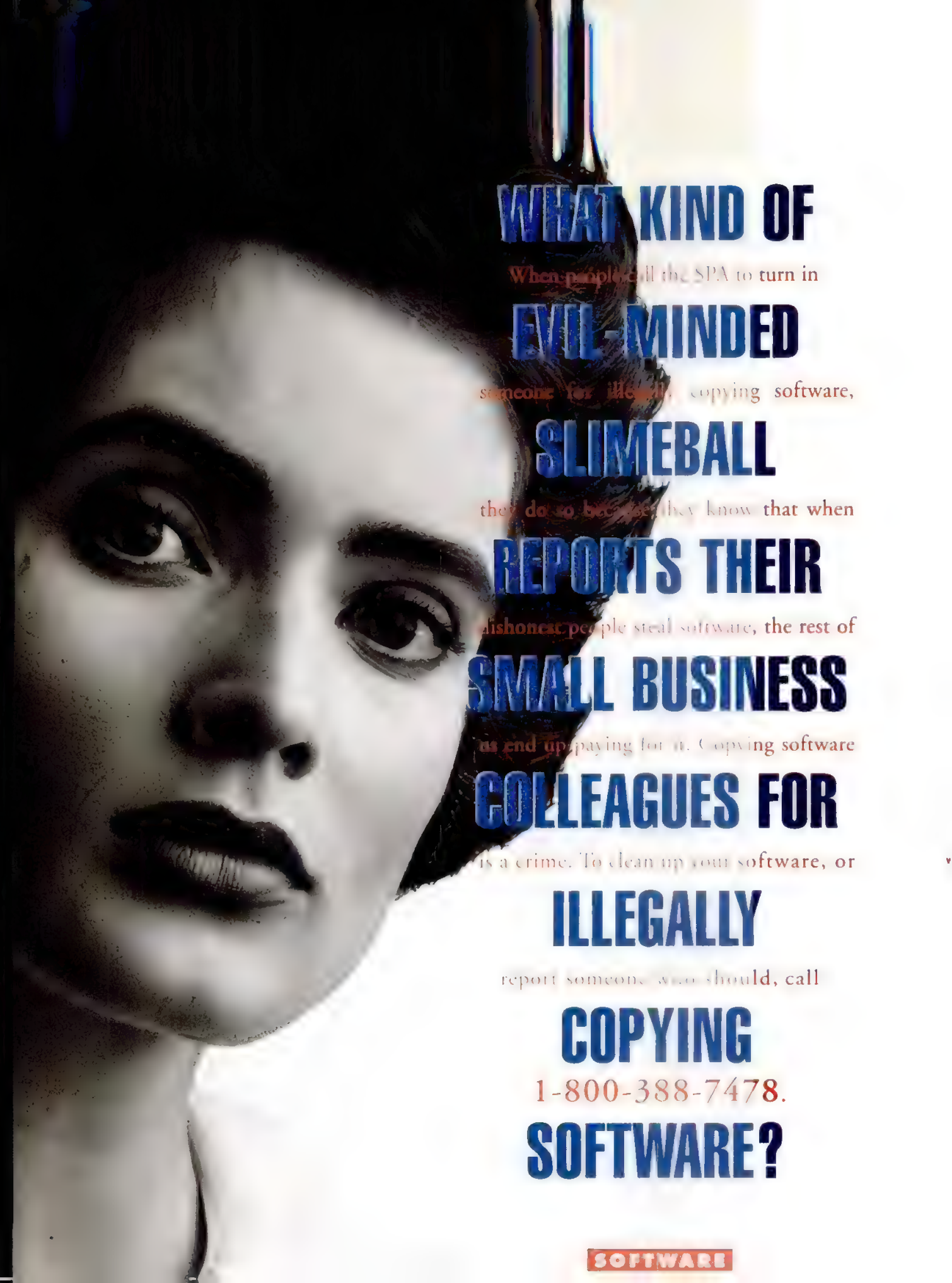


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SOFTWARE?

SOFTWARE

After Hours

Kids

Learning Life Skills

The Rabbits at Home

Online Computer Systems;
800-922-9204, 301-601-2195.
Circle 456 on reader service card
★★★    \$59.95

The Rabbits at Home takes a different approach from most children's software. Here, rather than read a story or play a game, children follow the Rabbit kids as they pursue everyday activities. The premise is simple. Your child selects a time of day, such as bedtime, then watches as Roly, Rags, and Rosie carry out an action. Along the way they'll be asked to undertake a few limited tasks, such as filling the bathtub before the Rabbits take their evening bath.

Everything is done by mouse. Kids click on the back-

yard tree house to make Roly climb the ladder to join his siblings, or they can click on the hallway clock to choose an activity associated with a different time of day. Clicking on a storybook triggers the program's most distinguishing feature. The program reads a story to your kids; they can follow along with the included hardcover books. What they can't do, though, is interact with the on-screen tale the way they would with an electronic storybook program.

The Rabbits at Home lacks the high degree of interactivity of many kids' programs, but its emphasis on learning real world skills, like setting the table and bathing, is refreshing. There are no menus, buttons, or other Windows skills to learn, so even preschoolers can

quickly figure out what to do. The graphics are pretty, and the books are a treat. For children who don't require a high degree of interactivity to have fun, The Rabbits at Home is a learning adventure worth taking.

—J.W. Olsen



With The Rabbits at Home, clicking on an object such as the tree house results in a logical action—the rabbit climbs the tree.

Sports

Everything but the Lockout

NHL Hockey 95

Electronic Arts; 415-571-7171.
Circle 457 on reader service card
★★★★    \$59.95

Hockey fans, rejoice! There's one game in town this season, and it's a beauty.

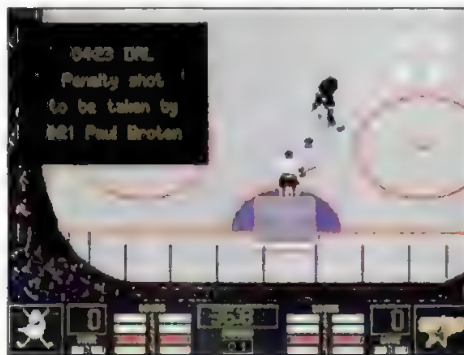
NHL Hockey 95, the second PC version of the Sega cartridge game, puts you in charge of 1 of 26 National Hockey League (NHL) teams for single exhibition games or an entire 84-game season.

(Don't worry, you can customize the length of the season.) At the end of the season, it's on to the playoffs and the quest for the Stanley Cup. A single player can take on the computer, or two players can play either against each other or on the same team.

This version packs in several new features, including drop passes, shot blocking, and penalty shots. (You can

computer often decides to have your player block shots at the most inopportune moments. The intermission graphics and several of the player animations have also been improved. For example, goalies now sprawl, flop, and dive all over the goal crease.

The Free Agent feature lets you create new players and add them to your team. Trades are allowed, but only between two human-controlled teams. To get around this, you can use



NHL Hockey 95 has a new penalty-shot feature that lets you go one-on-one with the goalie.

the Central Registry to transfer players from team to team.

NHL Hockey 95 is the best hockey game out there for the PC. It's a shame it can't be

QUICK CLIPS

Recommended
If You Call
Not Recommended

Ms. Winkle's Class

Isn't every kid's idea of fun to sit in front of a computer screen while some digital teacher lectures them for minutes at a time? Not likely. \$39.95; Abudoe Software Inc.; 206-462-8303.

MTV's Beavis and Butt-head Multimedia Screen Saver

Huh, huh, huh, huh... this screen saver, wallpaper, clock thing is cool. Yeah, dude, you use the video clips, music videos, and gross sounds on this CD-ROM to make your own screen show. Beavis and Butt-head rule. \$34.95; Sony Imagesoft; 310-449-2999.

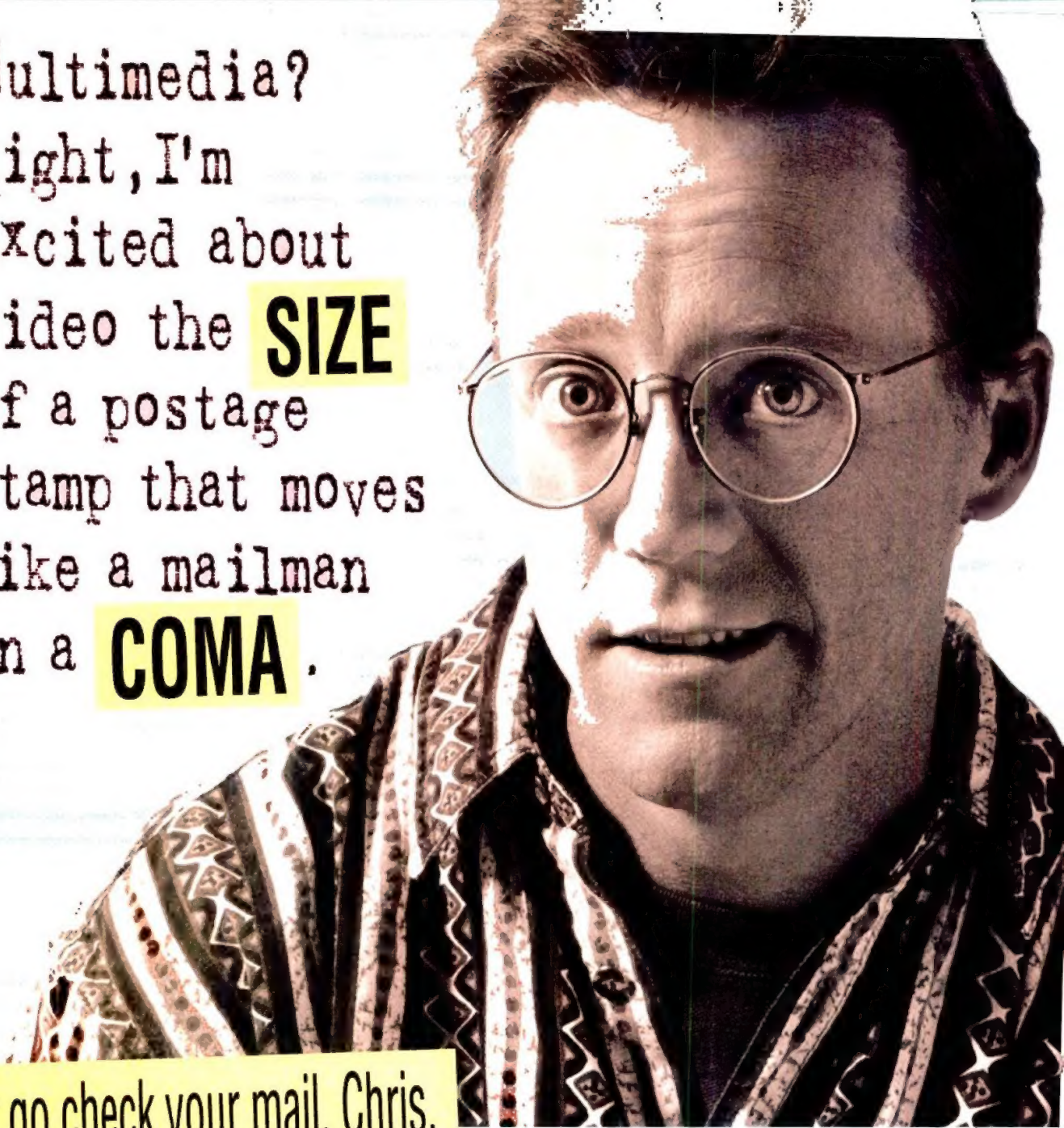
Multimedia Dogs

Need advice on the proper care and feeding of your four-legged friend? Then fetch this well-groomed CD-ROM reference guide and you'll be tail-wagging happy. \$39.95; Inroads Interactive; 303-444-0632.

? SimCity 2000 for Windows

If you already own the DOS version of this outstanding simulation, you may want to pass on this edition—unless you need to

Multimedia?
Right, I'm
excited about
video the **SIZE**
of a postage
stamp that moves
like a mailman
in a **COMA**.

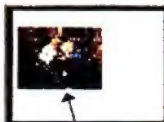


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By Don Willmott

Mac Users Have More Fun

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 You can jazz up any ad with computer clip art! (NABI BioMedical Center ad.)

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IN THE CARDS

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2000	\$4.2B

SOURCE: FROST & SULLIVAN INC.

 With growth like that, who needs plateaus? (Computer Reseller News.)

Boy, This Sounds Familiar

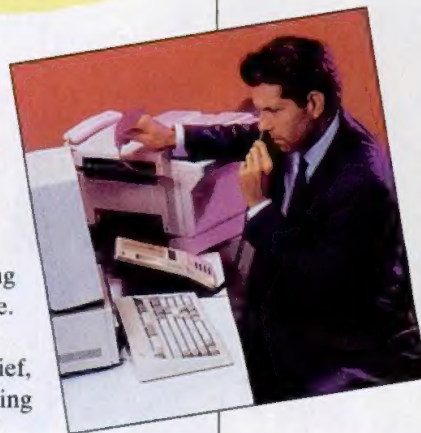
While you wait for Microsoft Windows 95 to ship, check out this missive: "Dear Rothschild Lecture ticket holder: We are writing to inform you that the evening with William (Bill) Gates (formerly to be held on November 2, 1994) will be postponed until February or March of 1995. . . . We apologize for any inconvenience."—LETTER FROM NEW YORK'S 92ND STREET YM-YWHA

The new QuickCorrect spell checker can actually fix errors as you make them.

 Spell-checker spelling mistakes are so ironic. (PC Connection catalog.)

Oh, My Nose! Oh, My Nose!

Ouch! It looks as if this guy, pictured on the back of the the Boca Research 14.4 modem box, is sticking something up his nose. Look again and you realize, with great relief, that he's actually talking on the phone. Whew!



Life in MousePad Land: Jerry tells his neighbors about his trip to "Placemat Land."



Richard Tennant

If your entry is used, we'll send you \$50 and a PC Magazine T-shirt. Send your entries to Abort, Retry, Fail?, PC Magazine, One Park Ave., New York, NY 10016-5802. Winners this issue: Alan Adler, Ted Buskirk, Brian Dowd, Chris Hammock, Jae-Hoon Kim, Vann Lantz, and Allen Unrau.

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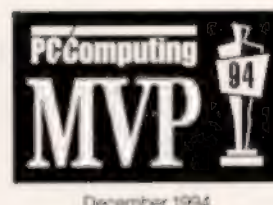
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